YEAR-BOOK

OF

THE ROYAL SOCIETY.

1901.

Price Five Shillings.

No. 5.

YEAR-BOOK

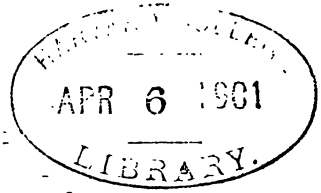
OF THE

ROYAL SOCIETY OF LONDON.

1901.

LONDON:
HARRISON AND SONS, ST. MARTIN'S LANE,
Printers in Ordinary to Her late Majesty.
1901.

No. 5.



HARRISON AND SONS,
PRINTERS IN ORDINARY TO HER LATE MAJESTY,
ST. MARTIN'S LANE.

CONTENTS.

MEMORANDUM AS TO THE WISHES OF THE SOCIETY IN RESPECT OF BENEFACTIONS TO THE SOCIETY.

From time to time since its foundation, the Royal Society has, through the generosity of benefactors, received funds, now amounting to a very considerable sum.

In the majority of cases the terms of gift have limited the application of the money to certain definite purposes, and, in particular, to the award of medals or other prizes for scientific discoveries or other contributions to the advancement of Natural Knowledge.

Every year the Council have to award several medals, including the Copley, Royal, Rumford, Davy, Darwin, Buchanan, Sylvester, and Hughes Medals, or some of these, and have been led by experience to the conclusion that it is neither to the advantage of the Society nor in the interests of the advancement of Natural Knowledge that this already long list of medals should in future be added to, and that, therefore, no further bequests to be awarded as prizes for past achievements should be accepted by the Society.

They desire, however, to make known that the funds belonging absolutely to the Society, funds tied down by no special directions as to their applications, funds which the Society are free to use for general purposes, are very few indeed. And the President and Council have again and again had the experience that the usefulness of the Society for the advancement of Natural Knowledge has been greatly hampered by the lack of funds of which they could freely make use according to their own judgment.

The President and Council are confident that it would not be difficult, wherever desirable, to associate in some conspicuous manner with any gift to the Society the name of the benefactor, and indeed they would wish to do so.*

The President and Council accordingly desire to make it generally known that while they will willingly receive gifts to be applied to special objects or for the benefit of particular sciences indicated by the donors, they consider that, in view of the varying necessities of Science, the most useful benefactions are those which are given to the Society in general terms for the advancement of Natural Knowledge.

YEAR-BOOK

OF

THE ROYAL SOCIETY.

1901.

FIXTURES OF THE SOCIETY.

1901.

JANUARY	17.	*Ordinary Meeting* at 4.30 P.M.
,,	24.	,, ,, ,,
,,	31.	,, ,, ,,
,,	31.	*Last day for receiving applications for Government Grants.*
FEBRUARY	7.	*Ordinary Meeting* at 4.30 P.M.
,,	14.	,, ,, ,,
,,	21.	,, ,, ,,
,,	28.	,, ,, ,,
MARCH	7.	*Last day for receiving certificates of Candidates for election.*
,,	7.	*Ordinary Meeting* at 4.30 P.M.
,,	14.	,, ,, ,,
,,	21.	,, ,, ,,
,,	28.	,, ,, ,,
MAY	2.	,, ,, ,,
,,	9.	,, ,, ,,
,,	23.	,, ,, ,,
JUNE	6.	*Election of Fellows* at 4 P.M.
,,	6.	*Ordinary Meeting* at 4.30 P.M.
,,	13.	,, ,, ,,
,,	20.	,, ,, ,,
NOVEMBER	21.	,, ,, ,,
,,	30.	*Anniversary Meeting* at 4 P.M.
DECEMBER	5.	*Ordinary Meeting* at 4.30 P.M.
,,	12.	,, ,, ,,

THE LIST OF THE ROYAL SOCIETY, JAN. 1, 1901.

HER SACRED MAJESTY QUEEN VICTORIA, PATRON.

Date of Election.	
1863. Feb. 12.	HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.
1893. June 8.	HIS ROYAL HIGHNESS THE DUKE OF YORK, K.G.

THE COUNCIL.

SIR WILLIAM HUGGINS, K.C.B., D.C.L., LL.D.—PRESIDENT.
ALFRED BRAY KEMPE, M.A.—TREASURER AND VICE-PRESIDENT.
PROF. SIR MICHAEL FOSTER, K.C.B., D.C.L., LL.D.—SECRETARY.
PROF. ARTHUR WILLIAM RÜCKER, M.A., D.Sc.—SECRETARY.
THOMAS EDWARD THORPE, C.B., Sc.D.—FOREIGN SECRETARY.

PROF. HENRY EDWARD ARMSTRONG, LL.D.
CHARLES VERNON BOYS.
HORACE T. BROWN, LL.D.
WILLIAM HENRY MAHONEY CHRISTIE, C.B.—VICE-PRESIDENT.
PROF. EDWIN BAILEY ELLIOTT, M.A.
HANS FRIEDRICH GADOW, Ph.D.
PROF. WILLIAM MITCHINSON HICKS, M.A.
LORD LISTER, F.R.C.S.—VICE-PRESIDENT.
PROF. WILLIAM CARMICHAEL McINTOSH, F.L.S.
LUDWIG MOND, PH.D.
PROF. ARNOLD WILLIAM REINOLD, M.A.
PROF. J. EMERSON REYNOLDS, Sc.D.
ROBERT HENRY SCOTT, Sc.D.
PROF. CHARLES SCOTT SHERRINGTON, M.D.
JOSEPH WILSON SWAN, M.A.
J. J. H. TEALL, M.A.—VICE-PRESIDENT.

*** *This Council will continue till November* 30, 1901.

Assistant-Secretary and Librarian.
ROBERT W. F. HARRISON.

Clerk.
THEODORE E. JAMES.

Assistant Librarian.
A. HASTINGS WHITE.

Papers Clerk—RICHARD CHAPMAN.

GOVERNMENT GRANT.
Clerk to the Committee—THE ASSISTANT SECRETARY.
Assistant ditto—FRANCIS A. TOWLE.

FELLOWS OF THE SOCIETY.

Abbreviated from the Official List of Fellows, and Corrected up to January 1, 1901.

(C) prefixed to a name indicates the award of the Copley Medal.
(R) ,, ,, ,, ,, ,, Royal Medal.
(Rm) ,, ,, ,, ,, ,, Rumford Medal.
(D) ,, ,, ,, ,, ,, Davy Medal.
(DW) ,, ,, ,, ,, ,, Darwin Medal.
(B) ,, ,, ,, ,, ,, Buchanan Medal.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1860.	'67–69 '77–79	V.P. '77–78	R.	Abel, Sir Frederick Augustus, Bart., K.C.B., D.C.L. (Oxon.), D.Sc. (Camb.). 2, *Whitehall-court*, S.W.; *and Imperial Institute, Imperial Institute-road*, S.W.
June 1, 1876.	'83–85 '91–93		Rm.	Abney, Sir William de Wiveleslie, Capt. R.E., K.C.B., D.C.L. (Dunelm.), Principal Assistant Secretary, Board of Education (Secondary Branch). *Rathmore Lodge, Bolton-gardens South, Earl's Court*, S.W.; *and Athenæum Club*, S.W.
June 6, 1872.	'82–84 '96–98			Adams, William Grylls, M.A., D.Sc., Professor of Natural Philosophy and Astronomy in King's College, London. 43, *Campden-hill-square*, W.
June 6, 1889.				Aitken, John, F.R.S.E. *Ardenlea, Falkirk*, N.B.
June 3, 1880.	'96–98			Allbutt, Thomas Clifford, M.A., M.D., Regius Professor of Physic in the University of Cambridge. *St. Radegund's, Cambridge.*
June 12, 1884.				Allman, George Johnston, LL.D. (Dubl.), D.Sc., Emeritus Professor of Mathematics in Queen's College, Galway. *St. Mary's, Galway.*
June 7, 1888.				Andrews, Thomas, Mem. Inst. C.E. *Ravencrag, Wortley, near Sheffield.*
June 1, 1876.	'88–90 1900–			Armstrong, Henry Edward, Ph.D. (Lips.), LL.D. (St. Andr.), Professor of Chemistry at the City and Guilds of London Central Institute. 55, *Granville-park, Lewisham*, S.E.; *and Athenæum Club*, S.W.
June 3, 1880.				Attfield, John, M.A., Ph.D. (Tüb.), Late Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain. *Ashlands, Watford; and* 111, *Temple Chambers*, E.C.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 3, 1858.	'61–63 '70–72 '78–79 '93–94	V.P. '71–72 '78–79 '93–94		Avebury, Right Hon. John Lubbock, Lord, D.C.L., LL.D. *High Elms, Down, Kent.*
June 2, 1881.	'89–91			Ayrton, William Edward, Professor of Electrical Engineering in the Central Technical College of the City and Guilds of London Institute. *Exhibition-road*, S.W.; *and* 41, *Kensington Park-gardens*, W.
June 4, 1885.				Baird, Andrew Wilson, Colonel, R.E., C.S.I. *Palmerscross, Elgin, N.B.; and East India United Service Club*, S.W.
June 5, 1890.	'92–93			Baker, Sir Benjamin, K.C.M.G., LL.D. 2, *Queen-square-place, Queen Anne's Mansions, Westminster; and Athenæum Club*, S.W.
June 9, 1898.				Baker, Henry Frederick, M.A., University Lecturer in Mathematics, Cambridge. 4, *Belvoir-terrace, Trumpington-road, Cambridge.*
June 6, 1878.	'83–84			Baker, John Gilbert, F.L.S. Late Keeper of the Herbarium, Royal Gardens, Kew. 3, *Cumberland-road, Kew.*
Jan. 12, 1888.				Balfour, Right. Hon. Arthur James, D.C.L. 10, *Downing-street*, S.W.; *and Whittinghame, Prestonkirk*, N.B.
June 12, 1884.	'92–94			Balfour, Isaac Bayley, D.Sc., M.D. (Edin.), Keeper of the Royal Botanic Garden, Edinburgh, Queen's Botanist in Scotland, and Professor of Botany in the University of Edinburgh. *Inverleith House, Edinburgh; and Athenæum Club*, S.W.
June 12, 1873.	'97–98			Ball, Sir Robert Stawell, Kt., Hon., M.A. (Cantab.), LL.D., F.R.A.S., Lowndean Professor of Astronomy and Geometry in the University of Cambridge. *The Observatory, Cambridge; and Athenæum Club*, S.W.
June 6, 1850.	'80–81	V.P. '80–81		Barlow, William Henry, F.R.S.E. *High Combe, Old Charlton, Kent.*
June 1, 1899.				Barrett, William F., M.R.I.A., Professor of Experimental Physics in the Royal College of Science for Ireland. 6, *De Vesci Terrace, Kingstown, co. Dublin.*
				Barry (*see* Wolfe Barry).
June 6, 1889.				Basset, Alfred Barnard, M.A. *Fledborough Hall, Holyport, Berks.*
June 4, 1868.				Bastian, Henry Charlton, M.A., M.D., Emeritus Professor of the Principles and Practice of Medicine, University College, Physician to University College Hospital. 8A, *Manchester-square*, W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1894.				Bateson, William, M.A. (Cantab.), *Merton House, Grantchester, Cambridge.*
June 11, 1857.	'65–67			Beale, Lionel Smith, M.B., late Prof. of the Principles and Practice of Medicine in King's College, London, and Government Medical Referee for England. 61, *Grosvenor-street*, W.
June 2, 1892.				Beddard, Frank Evers, M.A. (Oxon.), Lecturer on Comparative Anatomy, Guy's Hospital, Prosector to the Zoological Society *Zoological Society's Gardens, Regent's Park*, N.W.
June 12, 1873.				Beddoe, John, M.D., LL.D. (Edin.). *The Chantry, Bradford-on-Avon; and Athenæum Club*, S.W.
June 4, 1874.	'81–82			Bell, Sir Lowthian, Bart., M. Inst. C.E. *Rounton Grange, by Northallerton.*
June 12, 1884.				Bell, James, C.B., D.Sc. (Dubl.), late Principal of the Inland Revenue Laboratory, Somerset House. 52, *Cromwell-road, Hove, Brighton.*
June 3, 1897.				Bell, Robert, M.D., B.A.Sc., LL.D., Assistant Director of the Geological Survey of Canada. *Sussex-street, Ottawa, Canada.*
June 8, 1871.				Besant, William Henry, D.Sc., Fellow of St. John's College, Cambridge. *St. John's College, and Spring Lawn, Harvey-road, Cambridge.*
June 4, 1886.				Bidwell, Shelford, M.A., Sc.D., LL.B. *Riverstone Lodge, Southfields, Wandsworth*, S.W.
June 4, 1874.	'91–93	V.P. '92–93		Blanford, William Thomas, LL.D. (Univ. McGill). 72, *Bedford-gardens, Campden-hill, Kensington*, W.
June 6, 1878.	'80–82 '95 '97–99	V.P. '98–99		Bonney, Rev. Thomas George, D.Sc., LL.D. (Univ. McGill), Professor of Geology in University College, London. 23, *Denning-road, Hampstead*, N.W.
June 1, 1899.				Booth, Charles, Hon. Sc.D. (Camb.). 24, *Great Cumberland-place*, W.
June 5, 1890.				Bosanquet, Robert Holford Macdowall, M.A., Fellow of St. John's College, Oxford. *Castillo Zamora, Realejo-Alto, Teneriffe.*
June 7, 1888.				Bottomley, James Thomson, M.A., D.Sc. 13, *University-gardens, Glasgow.*
June 7, 1894.				Boulenger, George Albert, F.Z.S. 8, *Courtfield-road, South Kensington*, S.W.
June 13, 1895.				Bourne, Alfred Gibbs, D.Sc., Professor of Biology in the Presidency College, Madras. *Presidency College, Madras.*
June 4, 1891.				Bower, Frederick Orpen, D.Sc. (Camb.), Regius Professor of Botany in the University of Glasgow. 45, *Kersland-terrace, Hillhead, Glasgow.*
June 7, 1888.	1900–		R.	Boys, Charles Vernon, A.R.S.M. 27, *The Grove Boltons*, S.W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1894.				Bradford, John Rose, M.D., D.Sc., Physician to University College Hospital. 8, *Manchester-square*, W.
June 8, 1882.				Brady, George Stewardson, M.D., LL.D., Professor of Natural History in the Durham College of Science, Newcastle. 2, *Mowbray-villas, Sunderland.*
June, 12 1873.	'77–78			Brumwell, Sir Frederick Joseph, Bart., D.C.L., LL.D., M. Inst. C.E. 5, *Great George-street, Westminster*, S.W.
June 3, 1875.				Brandis, Sir Dietrich, K.C.I.E., Ph.D., LL.D., late Inspector-General of Forests to the Government of India. *Capel House, Kew Green, Surrey.*
June 3, 1897.				Broadbent, Sir William Henry, Bart., M.D. (Lond.), LL.D. (St. Andrew's), F.R.C.P., Physician Extraordinary to the Queen, Consulting Physician to St. Mary's Hospital, and to the London Fever Hospital. 84, *Brook-street*, W.
June 12, 1879.	'91–92			Brown, Alexander Crum, D.Sc., LL.D., Professor of Chemistry in the University of Edinburgh. 8, *Belgrave-crescent, Edinburgh.*
June 9, 1898.				Brown, Ernest William, M.A., Sc.D., Professor of Mathematics in Haverford College. *Haverford College, Philadelphia, U.S.A.*
June 6, 1889.	'99–			Brown, Horace T., LL.D., F.C.S., F.I.C. 52, *Nevern-square, Kensington*, S.W.
June 7, 1883.				Browne, Sir James Crichton, Kt., M.D., LL.D. 61, *Carlisle-place Mansions, Victoria-street*, S.W.
June 1, 1899.				Bruce, David, M.B., Major R.A.M.C. *Pietermaritzburg, Natal.*
June 4, 1874.	'82–84			Brunton, Sir Thomas Lauder, M.D., Sc.D. (Edin.). 10, *Stratford-place, Oxford-street*, W.; *and Athenæum Club.*
June 13, 1895.				Bryan, George Hartley, Sc.D., Professor of Mathematics in the University College of North Wales. *Plas Gwyn, Bangor, N. Wales.*
Dec. 14, 1893.	'99–1900			Bryce, Right Hon. James, D.C.L. 54, *Portland-place*, W.
June 9, 1898.				Buchan, Alexander M.A LL.D. 42 *Heriot-row, Edinburgh.*
June 9, 1887.				Buchanan, John Young, M.A., F.R.S.E. *Christ's College, Cambridge.*
June 11, 1857.				Buckton, George Bowdler, F.E.S., F.L.S. *Weycombe, Haslemere, Surrey.*
June 12, 1879.				Buller, Sir Walter Lawry, K.C.M.G., D.Sc. *The Terrace, Wellington, New Zealand.*
June 5, 1890.				Burbury, Samuel Hawkeley, M.A. 17, *Upper Phillimore-gardens, Kensington*, W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 14, 1900.				Burch, George James, M.A. 20, *Museum-road, Oxford.*
June 1, 1893.				Burnside, William, M.A., Professor of Mathematics, Royal Naval College, Greenwich. *The Croft, Bromley-road, Catford,* S.E.
June 7, 1894.				Callendar, Hugh Longbourne, M.A., Quain Professor of Physics in University College, London. *University College, Gower Street,* W.C.
June 8, 1871.	'77–79			Carruthers, William, F.L.S., F.G.S., Late Keeper of the Botanical Department, British Museum. 14, *Vermont-road, Norwood,* S.E.
June 9, 1887.				Cash, John Theodore, M.D., Regius Professor of Materia Medica in the University of Aberdeen. 9, *Albyn-place, Aberdeen.*
Dec. 14, 1882.				Chamberlain, Right. Hon. Joseph, D.C.L. (Oxon.), LL.D. (Cantab.). 40, *Prince's-gardens; and Athenæum Club,* S.W.
June 7, 1894.				Cheyne, William Watson, M.B., F.R.C.S., Professor of Surgery in King's College, London. 75, *Harley-street,* W.
June 3, 1897.				Chree, Chas., M.A., Sc.D., Superintendent of the Observatory Department of the National Physical Laboratory. *Old Deer Park, Richmond, Surrey.*
June 2, 1881.	'83–85 '89–91 1900–	V.P. '90–91 1900–		Christie, William Henry Mahoney, C.B., M.A., Astronomer Royal. *Royal Observatory, Greenwich,* S.E.
June 7, 1888.				Church, Arthur Herbert, M.A. (Oxon.), Professor of Chemistry in the Royal Academy of Arts, President of the Mineralogical Society. *Shelsley, Kew.*
June 7, 1888.			R.	Clarke, Alexander Ross, Colonel, R.E., C.B. *Boldrewood, Redhill, Surrey.*
June 8, 1882.	'88–90			Clarke, Charles Baron, M.A. (Cantab.). 13, *Kew Gardens-road, Kew.*
June 4, 1896.				Clarke, Lieut.-Colonel Sir George Sydenham, R.E., K.C.M.G. 13, *Gledhow-gardens,* S.W.
June 6, 1872.	'97–98			Cleland, John, M.D., D.Sc., LL.D., Professor of Anatomy in the University of Glasgow. *University, Glasgow.*
June 9, 1848.	'78–80			Clerk, Henry, Major-General, R.A. "*Mountfield,*" 5, *Upper Maze-hill, St. Leonard's-on-Sea.*
June 4, 1868.	'71–73 '85–87 '96–98	V.P. '96–98		Clifton, Robert Bellamy, M.A. (Cantab. et Oxon.), Professor of Experimental Philosophy in the University of Oxford. 3, *Bardwell-road, Banbury-road, Oxford; and Athenæum Club.*
June 4, 1896.				Collie, J. Norman, Ph.D. 16, *Campden-grove, Kensington,* W.
June 4, 1885.	'93–95			Common, Andrew Ainslie, LL.D. (St. And.), D.Sc. 63, *Eaton-rise, Ealing,* W.

Date of Election.	Member of Council	Held Office.	Medals.	
June 6, 1878.				Cotterill, James Henry, M.A., late Professor of Applied Mechanics, Royal Naval College, Greenwich. 15, *St. Alban's Mansions, Kensington Court Gardens*, W.
June 6, 1878.	'78–79			Crawford, James Ludovic, Earl of, K.T., LL.D. 2, *Cavendish-square*, W.; *and Haigh Hall, Wigan.*
June 4, 1885.	'98–1900			Creak, Ettrick William, Captain R.N. 9, *Hervey-road, Blackheath*, S.E.
June 4, 1868.				Crofton, Morgan William, D.Sc., Fellow of the Royal University of Ireland.
June 4, 1863.	'77–79 '94–96	V.P. '95–96	R. D.	Crookes, Sir William, 7, *Kensington-park-gardens*, W.; *and Athenæum Club*, S.W.
April 3, 1879.	'80–81			Cross, Right Hon. Richard Assheton, Viscount, G.C.B., D.C.L. 12, *Warwick-square and Athenæum Club*, S.W.; *and Eccle Riggs, Broughton-in-Furness, Lancashire.*
June 4, 1891.	'98–99			Cunningham, Daniel John, M.D., D.C.L., Prof. of Anatomy in the University of Dublin. 43, *Fitzwilliam-place, Dublin.*
June 6, 1889.				Cunningham, David Douglas, C.I.E., M.B., Brigade Surgeon Lieut.-Col. Bengal Medical Service; Late Professor of Physiology in the Medical College, Calcutta. *Torre Mount, Torquay.*
Dec. 15. 1898.				Curzon of Kedleston, George Nathaniel, Lord. *Government House, Calcutta.*
June 3, 1880.				Dallinger, Rev. William Henry, LL.D., Sc.D. (Dubl.). *Ingleside, Newstead-road, Lee*, S.E.
June 8, 1882.	'94-95			Darwin, Francis, M.A. and M.B. (Cantab.), Reader in Botany in the Univ. of Cambridge. *Wychfield, Huntingdon-road, Cambridge.*
June 12, 1879.	'84–85 '86–87		R.	Darwin, George Howard, M.A., LL.D. (Glasc.), Plumian Professor of Astronomy and Experimental Philosophy in the University of Cambridge. *Newnham Grange, Cambridge.*
Jan. 24, 1895.				Davey, Right Hon. Horace, Lord, M.A., D.C.L. 86, *Brook-street*, W.; *and Verdley-place, Fernhurst, Sussex.*
June 14, 1900.				David, T. W. Edgeworth, B.A. (Oxon.), F.G.S., Professor of Geology in the University of Sydney. *The University, Sydney, N.S.W.*
June 6, 1867.	'89–91			Dawkins, W. Boyd, M.A., D.Sc. (Oxon.), Professor of Geology and Palæontology in the Victoria University, Manchester. *Woodhurst, Fallowfield, Manchester.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 4, 1891.				Dawson, George Mercer, C.M.G., LL.D., Director of the Geological Survey of Canada. *Sussex-street, Ottawa, Canada.*
June 6, 1861.	'70–72 '81–83			Debus, Heinrich, Ph.D., Lecturer on Chemistry at Guy's Hospital. 4, *Schlangenweg, Cassel, Hessen, Germany.*
Mar. 3, 1892.				Devonshire, Spencer Compton Cavendish, Duke of, K.G., M.A., LL.D., Chancellor of the University of Cambridge. *Devonshire House, Piccadilly,* W.; *and Chatsworth, Derbyshire.*
June 7, 1877.	'85–86 '98–1900	V.P. '99–1900	Rm.	Dewar, James, M.A., LL.D., F.C.S., Jacksonian Prof. of Natural Experimental Philosophy in the University of Cambridge, Fullerian Prof. of Chemistry in the Royal Institution. 1, *Scroope-terrace, Cambridge; and Royal Institution, Albemarle-street,* W.
June 4, 1885.				Divers, Edward, M.D., Emeritus Professor of Chemistry in the Imperial University, Japan. 9, *Rugby Mansions, Addison-bridge, Kensington,* W.
June 4, 1886.				Dixon, Harold B., M.A., F.C.S., Professor of Chemistry and Director of the Chemical Laboratories in Owens College, Manchester. *Owens College, Manchester.*
June 4, 1896.				Downing, Arthur Matthew Weld, D.Sc. 74, *Vanbrugh-park, Blackheath,* S.E.
Feb. 22, 1855.				Ducie, Henry John Reynolds-Moreton, Earl of, F.G.S. *Tortworth Court, Falfield, Gloucestershire.*
Feb. 9, 1865.				Dufferin and Ava, Frederick Temple Blackwood, Marquis of, K.P., G.C.B., D.C.L. *Clandeboye, Co. Down, Ireland.*
June 1, 1893.				Dunstan, Wyndham R., M.A., F.I.C., Director of the Scientific and Technical Department of the Imperial Institute. *Imperial Institute,* S.W.
June 3, 1875.				Dupré, August, Ph.D., F.C.S., Lecturer on Chemistry at the Westminster Hospital. 2, *Edinburgh Mansions, Howick-place,* S.W.; and *Mount Edgcumbe, Benhill-road, Sutton, Surrey.*
				Dyer (*see* Thiselton-Dyer).
June 4, 1895.				Elgar, Francis, LL.D. 18, *York-terrace, Regent's-park,* N.W.
June 13, 1895.				Eliot, John, C.I.E., M.A., Meteorological Reporter to the Government of India, and Director-General of Indian Observatories. *Indian Meteorological Office, Simla.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 12, 1873.				Ellery, Robert Lewis John, C.M.G., F.R.A.S., late Government Astronomer, and Director of the Observatory. *Melbourne, Victoria.*
June 4, 1891.	'99–			Elliott, Edwin Bailey, M.A., F.R.A.S., Waynflete Professor of Pure Mathematics in the University of Oxford. 4, *Bardwell-road, Oxford.*
June 1, 1893.				Ellis, William, F.R.A.S., late Superintendent of the Magnetical and Meteorological Department, Royal Observatory, Greenwich. 12, *Vanbrugh-hill, Blackheath*, S.E.
June 3, 1897.				Elwes, Henry John, F.L.S., F.Z.S. *Colesborne Park, Andoversford, Gloucestershire.*
June 3, 1869.				Esson, William, M.A., F.C.S., F.R.A.S., Savilian Professor of Geometry in the University of Oxford. • *Merton College; and* 13, *Bradmore-road, Oxford.*
June 8, 1871.	'84–85	V.P. '74–75		Etheridge, Robert, F.R.S.E., F.G.S. 14, *Carlyle-square, Chelsea*, S.W.
June 2, 1864.	'67–68 '73–75 '78–98	TREAS. '78–98		Evans, Sir John, K.C.B., D.C.L., LL.D. *Nash Mills, Hemel Hempstead; and Athenæum Club.*
June 12, 1879.				Everett, Joseph David, M.A., D.C.L., Professor of Natural Philosophy in Queen's College, Belfast. 11, *Leopold-road, Ealing*, W.
June 1, 1893.				Ewart, James Cossar, M.D., Professor of Natural History in the University of Edinburgh. *The University, Edinburgh.*
June 9, 1887.	'96–98		R.	Ewing, James Alfred, Hon. M.A. (Camb.), B.Sc. (Edin.), Professor of Mechanism and Applied Mechanics in the University of Cambridge. *Langdale Lodge, Cambridge.*
June 14, 1900.				Farmer, John Bretland, M.A. (Oxon.), F.L.S., Professor of Botany in the Royal College of Science, London. *Claremont House, Wimbledon Common*, S.W.
June 7, 1866.				Farrar, Very Rev. Frederic William, M.A., D.D., Dean of Canterbury. *The Deanery, Canterbury.*
June 7, 1877.	'95–96			Fayrer, Sir Joseph, Bart., K.C.S.I., M.D., LL.D., Honorary Physician to the Queen. 16, *Devonshire-street, Portland-place*, W.
June 1, 1899.				Fenton, Henry John Horstman, M.A. (Camb.). 7, *Mortimer-road, Cambridge.*
June 7, 1877.				Ferrers, Rev. Norman Macleod, D.D., Master of Gonville and Caius College, Cambridge. *The Lodge, Gonville and Caius College, Cambridge.*
June 1, 1876.	'86–88		R.	Ferrier, David, M.D., F.R.C.P., Professor of Neuro-

Date of Election.	Member of Council.	Held Office.	Medals.	
				pathology, King's College, London. 34, *Cavendish-square*, W.; *and Athenæum Club*, S.W.
June 4, 1886.				Festing, Edward Robert, Major-General, R.E. (retired), C B., Science Museum Director, Victoria and Albert Museum. 30, *Queen's Gate-terrace*, S.W.
June 7, 1883.			R.	Fitzgerald, Prof. George Francis, M.A., D.Sc. 40, *Trinity College, Dublin.*
June 2, 1892.				Fleming, John Ambrose, M.A. (Camb.), D.Sc. (Lond.), Fellow and Professor of Electrical Engineering in University College, London. *University College, Gower-street*, W.C.; *and* 2, *Langland-place, Finchley-road, Hampstead*, N.W.
June 6, 1889.	'95–96 '96–97			Fletcher, Lazarus, M.A. (Oxon.), F.G.S., Keeper of Minerals in the British Museum. *Natural History Museum, Cromwell-road; and* 36, *Woodville-road, Ealing*, W.
June 9, 1887.				Forbes, George, M.A., Mem. Inst. C.E., formerly Professor of Nat. Phil. in Anderson's College, Glasgow. 34, *Great George-street*, S.W.
June 4, 1886.	'93–95		R.	Forsyth; Andrew Russell, M.A., Sc.D., Sadlerian Professor of Pure Mathematics in the University of Cambridge. *Trinity College, Cambridge; and Athenæum Club*, S.W.
June 2, 1892.				Foster, Clement Le Neve, B.A., D.Sc. (Lond.), Professor of Mining in the Royal College of Science, and H.M. Inspector of Mines. *Min-y-don, Llandudno.*
June 3, 1869.	'70–72 '77–78 '83–85 '91–93	V.P. '91–93		Foster, George Carey, B.A., late Professor of Physics in University College, London. *Ladywalk, Rickmansworth, Herts; and Athenæum Club*, S.W.
June 6, 1872.	'76–77 '81–	SEC. '81–		Foster, Sir Michael, K.C.B., M.D., D.C.L., LL.D., Professor of Physiology in the University of Cambridge. *Great Shelford, Cambridge.*
June 4, 1891.				Frankland, Percy Faraday, Ph.D., B.Sc., Professor of Chemistry in the University of Birmingham. *The University, Birmingham.*
June 7, 1877.				Fraser, Thomas Richard, M.D., F.R.C.P. (Edin.), Professor of Materia Medica and Clinical Medicine in the University, Edinburgh. 13, *Drumsheugh-gardens, Edinburgh.*
June 7, 1894.				Froude, Robert Edmund, Superintendent of the Admiralty Experimental Works, Gosport. *North Lodge, Alverstoke, Gosport.*
Dec. 13, 1883.				Fry, Right Hon. Sir Edward, D.C.L., LL.D. *Failand House, Failand, near Bristol.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 2, 1892.	'99–			Gadow, Hans Friedrich, Ph.D., M.A., Strickland Curator and Lecturer on the Advanced Morphology of Vertebrata in the University of Cambridge. *Zoological Laboratory, Cambridge.*
June 1, 1893.				Gairdner, Sir William Tennant, K.C.B., M.D., LL.D., late Professor of Medicine in the University of Glasgow. 32, *George-square, Edinburgh.*
June 7, 1860.	'65–66 '70–72 '76–77 '82–84	V.P. '70–72 '76–77 '83–84	R.	Galton, Francis, M.A., D.C.L. 42, *Rutland-gate*, S.W.
June 1, 1899.				Gamble, James Sykes, C.I.E., M.A. (Oxon), F.L.S. *Highfield, East Liss, Hants.*
June 6, 1872.	'86–88			Gamgee, Arthur, M.D., F.R.C.P., Emeritus Professor of Physiology in Owens College, Victoria University. 5, *Avenue du Kursaal, Montreux, Switzerland.*
June 5, 1890.			R.	Gardiner, Walter, M.A., F.L.S., University Lecturer in Botany at Cambridge. 45, *Hill's-road, Cambridge.*
June 3, 1858.				Garrod, Sir Alfred Baring, M.D., Consulting Physician to King's College Hospital, Physician Extraordinary to the Queen. 10, *Harley-street*, W.
June 8, 1882.	'95–97		R.	Gaskell, Walter Holbrook, M.A., M.D., Lecturer in Physiology at Cambridge. *The Uplands, Great Shelford, near Cambridge.*
June 1, 1865.	'85–87 '89–93	FOR. SEC. '89–93 V.P. '85–87	R.	Geikie, Sir Archibald, Knt., Sc.D., LL.D., Director-General of the Geological Survey of the United Kingdom, and of the Museum of Practical Geology, London. *Geological Survey Office*, 28, *Jermyn-street*, S.W.; 10, *Chester-terrace, Regent's Park*, N.W.
June 3, 1875.				Geikie, James, D.C.L., LL.D., Murchison Professor of Geology and Mineralogy in the University of Edinburgh. *Kilmorie, Colinton-road, Edinburgh.*
June 2, 1892.				Giffen, Sir Robert, K.C.B., LL.D. (Glasc.). 40, *Brunswick Road, Hove, Brighton.*
June 7, 1860.	'86–88		R.	Gilbert, Sir Joseph Henry, M.A., Sc.D., late Sibthorpian Professor of Rural Economy in the Univ. of Oxford. *Harpenden, St. Alban's; and Athenæum Club.*
June 4, 1891.				Gilchrist, Percy Carlyle, A.R.S.M. *Frognal Bank, Finchley-road, Hampstead*, N.W.
June 7, 1883.				Gill, Sir David, K.C.B., LL.D., Her Majesty's Astronomer at the Cape of Good Hope. *Royal Observatory, Cape of Good Hope.*

Date of Election.	Member of Council.	Held Office	Medals.	
June 2, 1853.	'63–64 '66–68		D.	Gladstone, John Hall, Ph.D., Sc.D. 17, *Pembridge-square*, W.
June 7, 1849.				Glaisher, James, F.R.A.S. *The Shola, Heathfield-road, South Croydon.*
June 3, 1875.	'83–84 '90–92			Glaisher, James Whitbread Lee, Sc.D. *Trinity College, Cambridge.*
June 8, 1882.	'92–94			Glazebrook, Richard Tetley, M.A., Director of the National Physical Laboratory. 23, *Queen's-road, Richmond, Surrey; and Athenæum Club*, S.W.
June 8, 1882.	'91–93			Godman, Frederick Ducane, D.C.L. (Oxon), F.L.S. 10, *Chandos-street, Cavendish-square*, W.; *and South Lodge, Horsham.*
June 3, 1880.				Godwin-Austen, Henry Haversham, Lieut.-Col., F.G.S. *Shalford House, Guildford.*
June 1, 1865.				Gore, George, LL.D. (Edin.). *Inst. Sci. Research*, 20, *Easy Row, Birmingham.*
Dec. 17, 1896.				Gorst, Right Hon. Sir John Eldon, Q.C., M.A. *Queen Anne's-mansions, St. James's-park*, S.W.; *and Howes Close, Cambridge.*
Jan. 18, 1872.				Goschen, Right Hon. George Joachim, Viscount, M.A. 69, *Portland-place*, W.
June 2, 1892.				Gotch, Francis, M.A., B.Sc., Waynflete Professor of Physiology in the University of Oxford. *The Lawn, Banbury-road, Oxford.*
June 9, 1887.				Gowers, Sir William Richard, M.D., F.R.C.P., Consulting Physician to University College Hospital; Physician to the National Hospital for the Paralysed and Epileptic. 50, *Queen Anne-street*, W.
Feb. 3, 1881.				Grant Duff, Right Hon. Sir Mountstuart Elphinstone, G.C.S.I., F.R.G.S. 11, *Chelsea Embankment; and Athenæum Club.*
June 4, 1896.				Gray, Andrew, M.A., Professor of Natural Philosophy in the University of Glasgow. 11, *The University, Glasgow.*
June 13, 1895.				Green, Joseph Reynolds, M.A., D.Sc., Professor of Botany to the Pharmaceutical Society of Great Britain. *Arncliffe, Grange-road, Cambridge.*
June 7, 1888.	'96–97			Greenhill, Alfred George, M.A., Professor of Mathematics in the Artillery College, Woolwich. 10, *New Inn*, W.C.
June 6, 1878.				Greenwell, Rev. William, M.A., D.C.L., Canon of Durham. *Durham.*
June 13, 1895.				Griffiths, Ernest Howard, M.A. 12, *Parkside, Cambridge.*
June 7, 1883.				Groves, Charles Edward, F.C.S., F.I.C. 352, *Kennington-road*, S.E.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1883.				Grubb, Sir Howard, F.R.A.S. 51, *Kenilworth-square, Rathgar, Dublin.*
June 6, 1867.	'74–76	V.P. '75–76	R.	Günther, Albert C. L. G., M.A., M.D., late Keeper of the Zoological Department in the British Museum. *Lichfield-road, Kew Gardens, Surrey.*
June 1, 1899.				Haddon, Alfred Cort, M.A., M.R.I.A., F.Z.S., Professor of Zoology in the Royal College of Science, Ireland. *Inisfail, Hills-road, Cambridge.*
June 3, 1897.				Haldane, John Scott, M.A., M.D., Lecturer in Physiology in the University of Oxford. 4, *St. Margaret's-road, Oxford.*
June 4, 1891.	'98–1900			Halliburton, William Dobinson, M.D., B.Sc., Professor of Physiology in King's College, London. *Church Cottage*, 17, *Marylebone-road*, N.W.
Jan. 13, 1887.				Halsbury, Right Hon. Hardinge Stanley Giffard, Earl of, M.A., D.C.L. 4, *Ennismore-gardens*, W.
June 4, 1863.	'78–80			Harcourt, Augustus George Vernon, M.A., D.C.L., Lee's Reader in Chemistry at Christ Church. *Cowley Grange, Oxford; and Athenæum Club*, S.W.
Dec. 15, 1881.				Harcourt, Right Hon. Sir William George Granville Venables Vernon, Kt., M.A. *Malwood, Lyndhurst, Hants.*
June 4, 1863.				Harley, Rev. Robert, M.A. *Rosslyn, Westbourne-road, Forest-hill*, S.E.; *and Athenæum Club*, S.W.
June 9, 1898.				Harmer, Sidney Frederic, M.A., Sc.D., Superintendent of the University Museum of Zoology, Cambridge. *King's College, Cambridge.*
June 12, 1884.				Hartley, Walter Noel, F.R.S.E., F.I.C., Professor of Chemistry in the Royal College of Science for Ireland. *Royal College of Science, Stephen's-green, Dublin; and* 36, *Waterloo-road, Dublin.*
June 3, 1897.				Haswell, William, M.A., D.Sc., Challis Professor of Zoology in the University of Sydney. *The University, Sydney, N.S.W.*
June 2, 1864.				Hay, Right Hon. Sir John Charles Dalrymple, Bart., Admiral, K.C.B., D.C.L. 108, *St. George's-square*, S.W.; *and Craigenveoch, Wigtownshire*, N.B.
June 1, 1876.				Hayward, Robert Baldwin, M.A. *Ashcombe, Shanklin, Isle of Wight.*
June 1, 1899.				Head, Henry, M.A., M.D., M.R.C.P., M.R.C.S. 61, *Wimpole-street*, W.
June 4, 1891.				Heaviside, Oliver. *Bradley View, Newton Abbot, Devon.*
June 7, 1866.				Hector, Sir James, K.C.M.G., M.D., Director of the Geological Survey, Colonial Laboratory, Meteorological and Weather Departments, and of the New

Date of Election.	Member of Council.	Held Office.	Medals.	
				Zealand Institute; Chancellor of the New Zealand University. *Wellington, New Zealand.*
June 1, 1899.				Hele-Shaw, Henry Selby, LL.D. (St. Andrew's), Harrison Professor of Engineering in University College, Liverpool. 27, *Ullett-road, Sefton-park, Liverpool.*
June 6, 1889.				Hemsley, William Botting, F.L.S., Keeper of the Herbarium, Royal Gardens, Kew. *Herbarium, Royal Gardens, Kew.*
June 3, 1875.				Hennessey, John Baboneau Nickterlien, C.I.E., M.A., late Deputy Surveyor General in charge of the Trigonometrical Surveys, Survey of India. *Merrimu,* 18, *Alleyn-park, West Dulwich,* S.E.; *and Athenæum Club,* S.W.
June 3, 1858.				Hennessy, Henry G., M.R.I.A., Professor of Applied Mathematics and Mechanism in the Roy. Coll. of Science for Ireland. 3, *Mount Morris Villas, Bray, co. Wicklow.*
June 4, 1874.	'82–83			Henrici, Olaus Magnus Friedrich Erdmann, Ph.D., LL.D., Professor of Mechanics and Mathematics in the City and Guilds of London Institute. *Central Technical College, Exhibition-road,* S.W.; *and* 34, *Clarendon-road, Notting Hill,* W.
June 2, 1892.	'98–1900			Herdman, William Abbott, D.Sc., F.L.S., Professor of Natural History in University College, Liverpool. *Croxteth Lodge, Ullett-road, Liverpool.*
June 12, 1884.				Herschel, Alexander Stewart, M.A., D.C.L., Honorary Professor of Physics and Experimental Philosophy in the Durham College of Science, Newcastle-on-Tyne. *Observatory House, Slough, Bucks.*
June 8, 1871.				Herschel, John, Col., R.E., F.R.A.S., late Deputy Superintendent, Great Trigonometrical Survey of India. *Observatory House, Slough, Bucks.*
June 13, 1895.				Heycock, Charles Thomas, M.A., Lecturer on Natural Science, King's College, Cambridge. 24, *Fitzwilliam-street, Cambridge.*
June 4, 1885.	1900–			Hicks, William Mitchinson, M.A., D.Sc., Principal and Professor of Physics in University College, Sheffield. *Dunheved, Endcliffe-crescent, Sheffield.*
June 13, 1895.				Hickson, Sydney John, D.Sc., M.A., Professor of Zoology in Owens College, Manchester. *Ellesmere House, Withington, Manchester.*
June 14, 1900.				Hill, Leonard, M.B., Lecturer on Physiology in the London Hospital Medical College. *Jasmine Cottage, Frognal, Hampstead,* N.W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1894.				Hill, Micaiah J.M., M.A., D.Sc., Professor of Mathematics, University College, London. *Lakeview, Northwood, Middlesex.*
June 4, 1896.				Hinde, George Jennings, Ph.D. *Ivythorn, Avondale-road, S. Croydon.*
June 1, 1893.				Hobson, Ernest William, D.Sc., Fellow of Christ's College, Cambridge. *The Gables, Mount Pleasant, Cambridge.*
June 13, 1895.				Holden, Henry Capel Lofft, Major, R.A. *The Eaves, Belvedere, Kent.*
Apr. 22, 1847.	'53–54 '56–58 '62–64 '70–80 '84–86	PRES. '73–78 V.P. '57–58 '63–64 '78–80 '84–86	C. R. Dw.	Hooker, Sir Joseph Dalton, G.C.S.I., D.C.L., LL.D. *The Camp, Sunningdale, Berkshire.*
June 14, 1900.				Horne, John, F.G.S. *Geological Survey Office, Edinburgh; and* 12, *Keith Crescent, Blackhall, Midlothian.*
June 4, 1886.	'98–99		R.	Horsley, Victor Alexander Haden, B.S., F.R.C.S., M.D., late Professor of Pathology in University College, London. 25, *Cavendish-square*, W.; *and Athenæum Club*, S.W.
June 3, 1897.				Howes, George Bond, F.L.S., F.Z.S., Professor of Zoology in the Royal College of Science, London. "*Ingledene*," *Barrowgate-road, Chiswick*, W.
June 1, 1893.				Howorth, Sir Henry Hoyle, K.C.I.E., D.C.L. 30, *Collingham-place, Cromwell-road*, S.W.
June 12, 1884.				Hudleston, Wilfrid H., M.A., F.G.S. 8, *Stanhope-gardens, South Kensington*, S.W.
June 6, 1889.				Hudson, Charles Thomas, M.A., LL.D. *Clarence-road Shanklin, Isle of Wight.*
June 1, 1865.	'66–68 '69–71 '80–82 '88–89 '95–97 1900–	V.P. '70–71 '95–97 PRES. 1900–	C. Rm. R.	Huggins, Sir William—PRESIDENT, K.C.B., D.C.L., LL.D. 90, *Upper Tulse-hill; and Athenæum Club*, S.W.
June 6, 1889.				Hughes, Thomas McKenny, M.A., F.G.S., Woodwardian Professor of Geology in the University of Cambridge. 18, *Hills-road, Cambridge.*
June 6, 1867.				Hull, Edward, M.A., LL.D., late Director of the Geological Survey of Ireland, and Professor of Geology in the Royal College of Science. 20, *Arundel-gardens, Notting-hill*, W.
June 8, 1882.				Hutchinson, Jonathan, LL.D., M.D., formerly President of and Professor of Pathology and Surgery

Date of Election.	Member of Council.	Held Office.	Medals.	
				in the Royal College of Surgeons. 15, *Cavendish-square*, W.
June 2, 1892.				Hutton, Frederick Wollaston, Captain, F.G.S., C.M.Z.S., Curator of the Canterbury Museum, Christchurch. *Canterbury Museum, Christchurch, New Zealand.*
June 6, 1878.				Jackson, John Hughlings, M.D., Consulting Physician to the London Hospital. 3, *Manchester-square*, W.
Feb. 5, 1891.				Jackson, Right Hon. William Lawies, 27, *Cadogan-square*, S.W.; *and Allerton Hall, Chapel Allerton, Leeds.*
June 4, 1885.				Japp, Francis Robert, M.A., LL.D., Professor of Chemistry in the University of Aberdeen. *University, Aberdeen.*
June 7, 1894.				Jervis-Smith, Rev. Frederick John, M.A., University Lecturer in Mechanics and Millard Lecturer in Experimental Mechanics, Trinity College, Oxford. 28, *Norham Gardens, Oxford.*
June 2, 1892.				Joly, John, M.A., B.E., D.Sc., Professor of Geology and Mineralogy in the University of Dublin. 12, *Northbrook-road, Leeson Park, Dublin.*
June 7, 1894.				Jones, John Viriamu, M.A., B.Sc., Principal and Professor of Physics in the University College of South Wales and Monmouthshire. 42, *Park-place, Cardiff.*
June 6, 1872.				Jones, Thomas Rupert, F.G.S. 17, *Parson's Green, Fulham*, S.W.
June 7, 1877.	'87–89			Judd, John Wesley, C.B., F.G.S., Professor of Geology in the Royal College of Science, London. 22, *Cumberland-road, Kew; Royal College of Science, South Kensington; and Athenæum Club*, S.W.
June 5, 1851.	'90–96	PRES. '90–95	C. R.	Kelvin, William Thomson, Lord, D.C.L., LL.D., Late Professor of Natural Philosophy in the University of Glasgow. *Netherhall, Largs, Ayrshire; and Athenæum Club*, S.W.
June 2, 1881.	'97–	V.P. TREAS. '98–		Kempe, Alfred Bray, M.A. 2, *Paper-buildings, Temple*, E.C.; *and* 10, *Porchester-square, Hyde Park*, W.
June 9, 1887.	'95–96			Kennedy, Alexander B. W., LL.D., Mem. Inst. C.E., Emeritus Professor of Engineering and Mechanical Technology in University College, London. 1, *Queen Anne-street, Cavendish-square*, S.W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 5, 1890.			R.	Kerr, Rev. John, LL.D., Mathematical Lecturer in the Free Church Training College, Glasgow. 113, *Hill-street, Glasgow.*
June 9, 1887.				King, Sir George, K.C.I.E., M.B., LL.D., late Superintendent of the Royal Botanical Gardens, Calcutta, and of the Government Cinchona Plantations, Darjeeling. c/o *Messrs. Grindlay & Co.*, 54, *Parliament-street*, S.W.
				Kingsburgh (*see* Macdonald).
June 3, 1897.				Kipping, F. Stanley, D.Sc. (Lond.), Professor of Chemistry, University College, Nottingham. *University College, Nottingham.*
June 9, 1887.	'93–95	V.P. '94–95		Kirk, Sir John, G.C.M.G., K.C.B., LL.D. *Wavertree, Sevenoaks, Kent; and Athenæum Club*, S.W.
June 3, 1875.	'88–90			Klein, Edward Emanuel, M.D., Lecturer on General Anatomy and Physiology in the Medical School, St. Bartholomew's Hospital. 19, *Earl's Court-square*, S.W.
June 12, 1884.	'94–96			Lamb, Horace, M.A., Professor of Mathematics in the Owens College, Manchester. 6, *Wilbraham-road, Fallowfield, Manchester.*
June 7, 1883.	'97–98		R.	Langley, John Newport, M.A., Fellow and Lecturer of Trinity College, Lecturer on Histology in the University of Cambridge. *Trinity College, Cambridge; and Athenæum Club*, S.W.
June 3, 1875.	'82–83 '88–90 '94–96	V.P. '95–96 '82–83	R.	Lankester, Edwin Ray, M.A., LL.D., Director of the Natural History Departments, British Museum. *British Museum (Nat. Hist.)*, *Cromwell-road*, S.W.; *and Athenæum Club*, S.W.
June 7, 1888.	'95–97		R.	Lapworth, Charles, LL.D., F.G.S., Professor of Geology in the University of Birmingham. 28, *Duchess-road, Edgbaston, Birmingham.*
June 2, 1892.	'97–99			Larmor, Joseph, M.A., D.Sc., late Professor of Natural Philosophy in Queen's College, Galway. *St. John's College, Cambridge.*
June 5, 1890.				Lea, Arthur Sheridan, Sc.D., formerly Lecturer in Physiology of Gonville and Caius College; sometime Assistant Lecturer of Trinity College, and University Lecturer, Cambridge. *Sunnyside, Sidcup, Kent.*
Jan. 26, 1899.				Lefevre, Right Hon. George John Shaw, M.A., 18, *Bryanston Square*, W.; *and Abbotsworthy House, Kingsworthy, Winchester.*
Jan. 20, 1898.				Lindley, Right Hon. Nathaniel, Lord. 19, *Craven Hill-gardens*, W.; *and Athenæum Club*, S.W.
June 9, 1898.				Lister, Arthur, F.L.S. *Leytonstone, Essex.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1860.	'81-83 '93-	FOR. SEC. 93-95 V.P. 1900- PRES. '95-1900	R.	Lister, Joseph, Lord, F.R.C.S., D.C.L., LL.D., Emeritus Professor of Clinical Surgery, King's College, London, Serjeant-Surgeon to the Queen. 12, *Park-crescent, Portland-place*, W.
June 14, 1900.				Lister, Joseph Jackson, M.A., F.Z.S., *St. John's College, Cambridge.*
June 12, 1879.	'91-92	V.P. '91-92		Liveing, George Downing, M.A., Sc.D., Professor of Chemistry in the University of Cambridge. *Newnham, Cambridge.*
June 8, 1882.				Liversidge, Archibald, M.A., LL.D., Professor of Chemistry in the University of Sydney. *St. Mark's Road, Darling Point, Sydney, New South Wales.*
June 3, 1869.	'74-76 '85-87 '91-93	V.P. '92-93	Rm.	Lockyer, Sir Norman, K.C.B., 16, *Penywern-road*, S.W.; *and Solar Physics Observatory, South Kensington*, S.W.
June 9, 1887.	'93-94		Rm.	Lodge, Oliver Joseph, D.Sc., LL.D., Principal of the University of Birmingham. *The University, Birmingham.*
June 7, 1894.				Love, Augustus Edward Hough, M.A., Fellow of St. John's College, Cambridge; Sedleian Professor of Natural Philosophy in the University of Oxford. 34, *St. Margaret's Road, Oxford.*
June 7, 1894.				Lydekker, Richard, B.A. *The Lodge, Harpenden, Herts.*
June 2, 1881.	'94-95			Macalister, Alexander, M.A., M.D., Professor of Anatomy in the University of Cambridge. *Torrisdale, Cambridge.*
June 13, 1895.				M^{c}Clean, Frank, M.A., LL.D. *Rusthall House, Tunbridge Wells.*
June 1, 1865.				M^{c}Clintock, Sir Francis Leopold, Admiral, K.C.B., D.C.L., LL.D. 8, *Atherstone-terrace, Gloucester-road*, S.W.
June 9, 1859.				Macdonald, John Denis, M.D., Inspector-Geneal of Hospitals and Fleets, R.N. *Amwell-place, Hassocks, Sussex.*
May 3, 1888.				Macdonald, Right Hon. John Hay Athole, C.B., LL.D., Lord Justice-Clerk of Scotland, and Lord President of the Second Division of the Court of Session. 15, *Abercromby-place, Edinburgh.*
June 13, 1895.				Macewen, William, M.D., LL.D., Professor of Surgery in the University of Glasgow, 3, *Woodside-crescent, Glasgow.*
June 14, 1900.				MacGregor, James Gordon, D.Sc. (Lond.), Professor of Physics in Dalhousie College, Halifax, N.S. *Dalhousie College, Halifax*, N.S.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 7, 1877.	'00–	R.		McIntosh, William Carmichael, M.D., LL.D., Professor of Natural History in the University of St. Andrews; Director of the University Museum, and of the Marine Laboratory, St. Andrews. 2, *Abbotsford-crescent, St. Andrews, Scotland.*
June 12, 1884.	'92–93			McKendrick, John Gray, M.D., LL.D., Professor of Physiology in the University of Glasgow. 2, *Florentine-gardens, Glasgow.*
June 7, 1877.				McLachlan, Robert, F.L.S., F.E.S. *Westview*, 23, *Clarendon-road, Lewisham*, S.E.
June 2, 1881.	'87–89			McLeod, Herbert, F.I.C., F.C.S., Professor of Chemistry in the Royal Indian Engineering College, Cooper's-hill. *The College, Cooper's-hill, Staines.*
June 9, 1898.				McMahon, Charles Alexander, Lieut.-General, V.P.G.S. 20, *Nevern-square*, S.W.
June 5, 1890.	'95–97		R.	MacMahon, Percy Alexander, Major, R.A., D.Sc., F.R.A.S. *Shaftesbury-mansions*, 52, *Shaftesbury-avenue*, W.
June 8, 1882.				Malet, John Christian, M.A., Assistant Commissioner of Intermediate Education, Ireland. *Carbery, Silchester-road, Kingstown, Co. Dublin.*
June 7, 1877.				Mallet, John William, M.D., LL.D. *University of Virginia, Albemarle Co., Virginia, United States.*
June 14, 1900.				Manson, Patrick, C.M.G., F.R.C.P. Physician and Medical Adviser to the Colonial Office. 21, *Queen Anne Street, Cavendish Square*, W.
June 12, 1873.				Markham, Sir Clements Robert, K.C.B., P.R.G.S. *Athenæum Club; and* 21, *Eccleston-square*, S.W.
June 4, 1891.				Marr, John Edward, M.A., F.G.S., Fellow and Lecturer of St. John's College, Cambridge, and University Lecturer in Geology. *St. John's College, Cambridge.*
June 13, 1895.				Martin, Sidney, M.D., F.R.C.P., Assistant Physician in University College Hospital, and in the Hospital for Consumption, Brompton. 10, *Mansfield-street, Cavendish-square*, W.
June 2, 1870.	'73–75 97–99	V.P. '97–99		Maskelyne, Nevil Story, M.A., F.G.S., late Professor of Mineralogy in the University of Oxford. *Basset Down House, Swindon.*
June 2, 1870.				Masters, Maxwell Tylden, M.D., F.L.S. *Mount Avenue, Ealing*, W.
June 3, 1897.				Mathews, George Ballard, M.A., late Professor of Mathematics in the University College of North Wales, 10, *Menai View, Upper Bangor, North Wales.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 12, 1879.				Matthey, George, F.C.S., Assoc. Inst. C.E. *Cheyne House, Chelsea Embankment*, S.W.
Jan. 27, 1898.				Maxwell, Right Hon. Sir Herbert Eustace, Bart. 49, *Lennox Gardens*, S.W.; *and The Airlour, Whauphill, Wigtownshire, N.B.*
June 7, 1877.				Medlicott, Henry Benedict, M.A., F.G.S., late Director of the Geological Survey of India. 43, *St. John's-road, Clifton, Bristol.*
June 4, 1886.	'96-98			Meldola, Raphael, F.C.S., F.I.C., Professor of Chemistry in the Finsbury Technical College, City and Guilds of London Institute. 6, *Brunswick-square*, W.C.
June 1, 1876.				Meldrum, Charles, C.M.G., M.A., LL.D., late Director of the Royal Alfred Observatory, Mauritius. c/o *W. P. Meldrum, Esq., University Hall, Riddle's Court, Edinburgh.*
June 2, 1892.				Miall, Louis Compton, F.L.S., F.G.S., Professor of Biology in the Yorkshire College, Leeds. 8, *Spring-road, Headingley, Leeds.*
June 4, 1896.				Miers, Henry Alexander, M.A., Professor of Mineralogy in the University of Oxford. *Magdalen College, Oxford.*
June 4, 1874.				Mills, Edmund James, D.Sc. F.I.C. Young Professor of Technical Chemistry in the Glasgow and West of Scotland Technical College, Glasgow. 60, *John-street, Glasgow.*
June 9, 1887.				Milne, John, F.G.S., late Professor of Mining and Geology in the Imperial College of Engineering, Japan. *Shide Hill House, Shide, Newport, I.W.*
June 13, 1895.				Minchin, George M., M.A., Professor of Mathematics in the Royal Indian Engineering College, Cooper's-hill. *The College, Cooper's-hill, Staines.*
June 8, 1871.				Moncrieff, Sir Alexander, Colonel (late R.A), K.C.B. 15, *Vicarage-gate, Kensington*, W.; *and Athenæum Club*, S.W.
June 4, 1891.	1900-			Mond, Ludwig, Ph.D., F.I.C. *The Poplars*, 20, *Avenue-road, Regent's-park*, N.W.; *and Winnington Hall, Northwich.*
June 1, 1899.				Morgan, Conwy Lloyd, F.G.S., Professor of Biology and Geology in University College, Bristol. 16, *Canynge-road, Clifton, Bristol.*
Dec. 15, 1892.				Morley, Right Hon. John, M.A., D.C.L., LL.D. 95, *Elm Park Gardens; and Athenæum Club*, S.W.
June 4, 1896.				Mott, Frederick Walker, M.D. *Pathological Laboratory, Claybury Asylum, Essex; and* 25, *Nottingham-place, W.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 3, 1880.				Moulton, John Fletcher, Q.C., M.A. 57, *Onslow-square*, S.W.
June 14, 1900.				Muir, Thomas, LL.D., Superintendent General of Education in Cape Colony. *Department of Public Education, Cape Town, South Africa.*
June 7, 1866.	'83–85 '89–91			Müller, Hugo, Ph.D., LL.D. 13, *Park-square East*, N.W.; *Crosby-hill, Camberley, Surrey; and Athenæum Club*, S.W.
June 3, 1897.				Murray, George Robert Milne, F.L.S., F.R.S.E., Keeper of the Botanical Department, British Museum. *Natural History Museum, Cromwell-road*, S.W.; *and Willow House, The Green, Ealing*, W.
June 4, 1896.			R.	Murray, Sir John, K.C.B., Ph.D. *Challenger Lodge, Wardie, Edinburgh.*
June 3, 1875.				Nares, Sir George Strong, Vice-Admiral, K.C.B. 11, *Claremont-road, Surbiton.*
June 3, 1897.				Neville, Francis Henry, M.A., Fellow and Lecturer in Natural Science, Sydney College. *Sidney College, Cambridge.*
June 2, 1870.	'79–81 '89–91	V.P. '89–91	R.	Newton, Alfred, M.A., F.L.S., Professor of Zoology and Comparative Anatomy in the University of Cambridge. *Magdalene College, Cambridge.*
June 1, 1893.				Newton, Edwin Tulley, F.G.S., F.Z.S. *Geological Museum, Jermyn-street*, S.W.
June 3, 1880.				Niven, Charles, M.A., F.R.A.S., Professor of Natural Philosophy in the University, Aberdeen. 6, *Chanonry, Old Aberdeen.*
June 8, 1882.	'92–94			Niven, William Davidson, C.B., M.A., Director of Studies in the Royal Naval College, Greenwich. *Greenwich*, S.E.
June 2, 1870.	'84–85 '89–90 '98–1900	V.P. '99–	R.	Noble, Sir Andrew, Capt., K.C.B., F.C.S. *Jesmond Dene House, Newcastle-upon-Tyne; and Athenæum Club*, S.W.
June 5, 1890.				Norman, Rev. Alfred Merle, M.A., D.C.L., Hon. Canon of Durham. *The Red House, Berkhamsted.*
June 21, 1900.				North, Rt. Hon. Sir Ford. 76, *Queensborough-terrace, Hyde Park*, W.
Jan. 8, 1880.				Northbrook, Thomas George Baring, Earl of, G.C.S.I., LL.D., D.C.L. 4, *Hamilton-place*, W.; *and Stratton, Micheldever Station, Hants.*
Nov. 22, 1900.				Northumberland, Henry George Percy, Duke of, K.G., F.S.A. 2, *Grosvenor-place*, S.W.
June 9, 1859.	'64–66 '79–81			Odling, William, M.B., V.P.C.S., Waynflete Professor of Chemistry in the University of Oxford. *Museum; and* 15, *Norham-gardens, Oxford.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 4, 1863.	'75–76 '80–82	R.		Oliver, Daniel, LL.D., F.L.S., late Keeper of the Herbarium and Library, Royal Gardens, Kew; Emeritus Professor of Botany, University College, London. 10, *Kew Gardens-road, Kew.*
June 4, 1868.				Ommanney, Sir Erasmus, Admiral, Knt., C.B., LL.D. 29, *Connaught-square, Hyde Park*, W., *and United Service Club.*
June 7, 1855.				Osler, Abraham Follett. *South Bank, Edgbaston, Birmingham.*
June 9, 1898.				Osler, William, M.D., F.R.C.P., Professor of Medicine in the Johns Hopkins University, Baltimore. 1, *West Franklin-street, Baltimore, Md., U.S.A.*
June 4, 1885.				O'Sullivan, Cornelius, F.I.C., F.C.S. 148, *High-street, Burton-on-Trent.*
June 8, 1882.				Palgrave, Robert Harry Inglis, F.S.S. *Belton, Great Yarmouth.*
June 9, 1898.				Parsons, Hon. Charles Algernon, M.A., M. Inst. C.E. *Holeyn Hall, Wylam-on-Tyne.*
June 4, 1863.				Pavy, Frederick William, M.D., LL.D., Consulting Physician and formerly Lecturer on Physiology and Comparative Anatomy and Zoology, and on Medicine, at Guy's Hospital, 35, *Grosvenor-street*, W.
June 2, 1892.				Peach, Benjamin Neeve, F.R.S.E., F.G.S. *Geological Survey Office, Sheriff Court-buildings, Edinburgh.*
June 4, 1896.			Dw.	Pearson, Karl, M.A., Professor of Mathematics and Mechanics in University College, London. 7, *Well-road, Hampstead*, N.W.
June 2, 1892.				Pedler, Alexander, F.C.S., F.I.C., Professor of Chemistry, Presidency College, Calcutta; and Meteorological Reporter to the Government of Bengal. 31/2, *Judge's Court-road, Alipur, Calcutta.*
June 7, 1894.				Penrose, Francis Cranmer, M.A., F.R.A.S., Honorary Fellow of Magdalene College, Cambridge. *Colebyfield, Copse Hill, Wimbledon*, S.W.
June 7, 1866.	'79–81 '92–94	V.P. '93–94	D. R.	Perkin, William Henry, LL.D., Ph.D. *The Chestnuts, Sudbury, Harrow.*
June 5, 1890.				Perkin, William Henry, junior, Ph.D., F.I.C., Professor of Organic Chemistry in Owens College, Manchester. *Fairview, Wilbraham-road, Fallowfield, Manchester.*
June 4, 1885.				Perry, John, D.Sc., Professor of Mechanics and Mathematics in the Royal College of Science.

Date of Election.	Member of Council.	Held Office.	Medals.	
				Royal College of Science, S. Kensington, S.W.
June 4, 1868.				Pettigrew, James Bell, M.D., F.R.C.P. (Edin.), Professor of Medicine and Anatomy and Dean of the Medical Faculty in the University of St. Andrews. *St. Andrews, N.B.*
June 9, 1887.				Pickard-Cambridge, Rev. Octavius, M.A. *Bloxworth, Wareham, Dorset.*
June 5, 1890.				Pickering, Spencer Percival Umfreville, M.A., F.C.S. *Harpenden, Herts; and* 48, *Bryanston-square*, W.
April 4, 1889.				Pirbright, Right Hon. Henry de Worms, Lord. 42, *Grosvenor-place*, S.W.; *Henley-park, Guildford.*
June 6, 1889.	'97–99			Poulton, Edward Bagnall, M.A. (Oxon.), F.L.S., Hope Professor of Zoology in the University of Oxford. *Wykeham House, Banbury-road, Oxford; and St. Helen's Cottage, St. Helen's, Isle of Wight.*
June 13, 1895.				Power, William Henry, Medical Officer, Local Government Board. *Glenbrook, Greenhithe; and Local Government Board, Whitehall*, S.W.
June 7, 1888.	'94–96			Poynting, John Henry, D.Sc., Professor of Physics in the University of Birmingham. *Foxhill, Alvechurch, Worcestershire,*
June 2, 1881.	'87–89			Preece, Sir William Henry, K.C.B., Pres. Inst. C.E. *Gothic Lodge, Wimbledon.*
June 13, 1895.				Purdie, Thomas, B.Sc., Ph.D., Professor of Chemistry in the University of St. Andrews. *The University, St. Andrews.*
June 4, 1886.	'91–92			Pye-Smith, Philip Henry, M.D., F.R.C.P., Physician to Guy's Hospital. 48, *Brook-street*, W.
June 14, 1900.				Rambaut, Arthur Alcock, M.A., Radcliffe Observer. *Radcliffe Observatory, Oxford.*
June 7, 1888.	'96–97		D.	Ramsay, William, Ph.D., F.I.C., Professor of Chemistry in University College, London. 12, *Arundel-gardens, Notting-hill*, W.
June 2, 1870.				Ransom, William Henry, M.D., Consulting Physician to the General Hospital, Nottingham. *The Pavement, Nottingham.*
June 12, 1884.				Ransome, Arthur, M.A., M.D., late Professor of Public Health in Owens College, Manchester. *Sunnyhurst, Dean-park, Bournemouth.*
June 12, 1873.	'77–79 '84–96	SEC. '85–96	R. C.	Rayleigh, John William Strutt, Lord, M.A., D.C.L., Professor of Natural Philosophy in the Royal Institution. *Terling Place, Witham, Essex.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 1, 1876.				Reed, Sir Edward James, K.C.B. *Broadway-chambers, Westminster*, S.W.
June 1, 1899.				Reid, Clement, F.G.S., F.L.S. *Geological Museum*, 28, *Jermyn-street*, S.W.
June 9, 1898.				Reid, Edward Waymouth, B.A., M.B., Professor of Physiology in University College, Dundee. *University College, Dundee.*
June 7, 1883.	'99–			Reinold, Arnold William, M.A., Professor of Physics in the Royal Naval College, Greenwich. 15, *Glenluce-road, Blackheath*, S.E.
June 3, 1880.	1900–			Reynolds, J. Emerson, M.D., Sc.D., Professor of Chemistry, University of Dublin. *Burleigh House, Burlington-road, Dublin.*
June 7, 1877.	'82–84		R.	Reynolds, Osborne, M.A., LL.D., Professor of Engineering in Owens College, Manchester. 19, *Lady Barn-road, Fallowfield, Manchester.*
Jan. 13, 1842.				Riddell, Charles James Buchanan, Major-Gen., C.B. *Oaklands, Chudleigh, Devonshire.*
June 4, 1885.				Ringer, Sydney, M.D., Holme Professor of Clinical Medicine, University College, London. 15, *Cavendish-place*, W.
May 24, 1860.				Ripon, George Frederick Samuel Robinson, Marquis of, K.G., D.C.L., F.L.S., 9, *Chelsea Embankment*, S.W.; *and Studley Royal, Ripon, Yorkshire.*
June 5, 1890.				Roberts, Isaac, ScD., F.R.A.S. *Starfield, Crowborough, Sussex.*
June 6, 1878.				Roberts, Samuel, M.A. 27, *Nassington-road, Hampstead*, N.W.
June 3, 1875.	'90-92			Roberts-Austen, Sir William Chandler, K.C.B., F.C.S., Prof. of Metallurgy, Royal College of Science, Chemist of the Royal Mint. *Royal Mint, Tower-hill*, E.; *Chilworth, Guildford; and Athenæum Club*, S.W.
Dec. 14, 1899.				Romer, Right Hon. Sir Robert, G.C.B., M.A. Lord Justice of Appeal, 27, *Harrington-gardens; and Athenæum Club*, S.W.
June 4, 1863.	'72–73 '81–83 '88–90	V.P. '81–82 '88–90	R.	Roscoe, Sir Henry Enfield, Knt., D.C.L., LL.D., Emeritus Professor of Chemistry in Victoria University (Owens College). 10, *Bramham-gardens*, S.W.; *and Athenæum Club*, S.W.
June 10, 1886.				Rosebery, Right Hon. Archibald Philip Primrose, Earl of, K.G., D.C.L. 38, *Berkeley-square*, W.; *and Dalmeny-park, Linlithgowshire.*
Dec. 19, 1867.	'71–72 '87–88	V.P. '71–72 '87–88		Rosse, Laurence Parsons, Earl of, K.P., D.C.L., LL.D., Chancellor of the University of Dublin. *Birr Castle, Parsonstown, Ireland.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 6, 1872.	'88–90			Routh, Edward John, D.Sc., LL.D. *Newnham Cottage, Queen's-road, Cambridge.*
June 12, 1884.	'87–89 '94–	SEC. '96–	R.	Rücker, Arthur William, M.A., D.Sc., Professor of Physics, Royal College of Science, London. 19, *Gledhow-gardens, South Kensington*, S.W.; *and Athenæum Club*, S.W.
June 4, 1886.				Russell, Henry Chamberlaine, C.M.G., B.A., F.R.A.S., Government Astronomer of New South Wales. *The Observatory, Sydney, N.S. Wales.*
June 6, 1872.	'85–86 '97–99	V.P. '97–99		Russell, William James, Ph.D., V.P.C.S., Lecturer on Chemistry at the Medical School of St. Bartholomew's Hospital. 34, *Upper Hamilton-terrace*, N.W.
Jan. 28, 1869.	'69–70 '82–83 '92–94	V.P. '82–83 '93–94		Salisbury, The Most Hon. Robert Arthur Talbot Gascoigne-Cecil, Marquis of, K.G., M.A., D.C.L., Chancellor of the University of Oxford. 20, *Arlington-street*, S.W.; *and Hatfield House, Hatfield, Herts.*
June 4, 1863.			C. R.	Salmon, Rev. George, D.D., D.C.L., LL.D., Provost of Trinity College, Dublin. *Trinity College, Dublin.*
June 2, 1881.	'87–88			Samuelson, Right Hon. Sir Bernhard, Bart., Mem. Inst. C.E. 56, *Princes-gate*, S.W.
June 6, 1867.	'73–75 '84–86 '93–95	V.P. '74–75 '94–95	R.	Sanderson, Sir John Burdon, Bart., M.A., M.D., Regius Professor of Medicine in the University of Oxford. *Physiological Laboratory; and* 64, *Banbury-road, Oxford.*
June 6, 1878.	'90–92			Schäfer, Edward Albert, M.R.C.S., Professor of Physiology in the University of Edinburgh. *University, Edinburgh.*
June 6, 1850.			D.	Schunck, Edward, F.C.S. *Kersal, Manchester.*
June 12, 1879.	'85–87 '98–99		R.	Schuster, Arthur, Ph.D., F.R.A.S., Professor of Physics in Owens College, Manchester. *Kent House, Victoria-park, Manchester.*
June 6, 1861.	'72–73 '86–87			Sclater Philip Lutley, M.A., Ph.D., Secretary of the Zoological Society of London. 3, *Hanover-square*, W.; *and Odiham Priory, Winchfield, Hants.*
June 9, 1898.				Scott, Alexander, M.A., D.Sc., Sec. C.S. *Davy-Faraday Laboratory, Albemarle-street*, W.
June 7, 1894.	'97–99			Scott, Dukinfield Henry, M.A., Ph.D., Honorary Keeper of the Jodrell Laboratory, Royal Gardens, Kew. *Old Palace, Richmond, Surrey.*
June 2, 1870.	1900–			Scott, Robert Henry, M.A., D.Sc. (Dubl.), F.R. Met. Soc., late Secretary to the Meteorological Council. 6, *Elm-park-gardens*, S.W.

Date of Election.	Member of Council.	Held Office.	Medals.	
June 4, 1886.	'92–94			Sedgwick, Adam, M.A., Fellow and Lecturer of Trin. Coll., Cambridge, and Reader of Animal Morphology in the University. 4, *Cranmer-road, Cambridge.*
June 12, 1879.				Seeley, Harry Govier, F.L.S., F.G.S., Professor of Geology and Geography with Mineralogy in King's College, London. 25, *Palace Gardens-terrace, Kensington*, W.
June 14, 1900.				Sell, William James, M.A., Senior Demonstrator of Chemistry in the University of Cambridge. 11, *Downing Grove, Cambridge.*
June 4, 1874.				Selwyn, Alfred Richard Cecil, C.M.G., F.G.S., late Director of the Geological Survey of Canada. *Sussex-street, Ottawa, Canada.*
June 9, 1898.				Seward, Albert Charles, M.A., University Lecturer in Botany, Cambridge. *Westfield, Huntingdon-road, Cambridge.*
June 5, 1890.				Sharp, David, M.B., C.M. (Edin.). *Museum of Zoology, Cambridge; and Hawthorndene, Hills-road, Cambridge.*
June 4, 1891.				Shaw, William Napier, M.A., Secretary to the Meteorological Council. *Meteorological Office*, 63, *Victoria-street, and* 10, *Moreton-gardens, South Kensington*, S.W.
June 9, 1898.				Shenstone, William Ashwell, F.I.C., F.C.S. *Clifton College; and Glenfarg, Percival-road, Clifton, Bristol.*
June 1, 1893.	1900–			Sherrington, Charles Scott, M.A., M.D., Holt Professor of Physiology in University College, Liverpool. 16, *Grove-park, Liverpool.*
Jan. 9, 1845.	'69–70 '78–80	V.P. '79–80	B.	Simon, Sir John, K.C.B., F.R.C.S., D.C.L., Consulting Surgeon to St. Thomas's Hospital. 40. *Kensington-square*, W.
June 5, 1862.				Simpson, Maxwell, B.A., M.D., late Professor of Chemistry in Queen's College, Cork. 7, *Darnley-road, Holland Park-avenue*, W.
				Smith (*see* Jervis-Smith).
June 9, 1887.				Snelus, George James, F.C.S., A.R.S.M. *Ennerdale Hall, Frizington, Cumberland.*
June 6, 1889.				Sollas, William Johnson, D.Sc., LL.D., Professor of Geology in the University of Oxford. 169, *Woodstock-road, Oxford.*
June 11, 1857.	'76–77		R.	Sorby, Henry Clifton, LL.D., F.L.S. *Broomfield, Sheffield.*
June 14, 1900.				Spencer, W. Baldwin, B.A. (Oxon.), Professor of Biology in the University of Melbourne. *The University, Melbourne, Victoria.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 6, 1878.				Sprengel, Hermann Johann Philipp, Ph.D., F.C.S., Royal Prussian Professor (titular). *Savile Club*, 107, *Piccadilly*, W.
June 1, 1899.				Starling, Ernest Henry, M.D., F.R.C.P., 8, *Park-square West, Regent's Park*, N.W.
June 4, 1896.				Stebbing, Rev. Thomas Roscoe Rede, M.A. *Ephraim Lodge, The Common, Tunbridge Wells.*
June 4, 1896.				Stewart, Prof. Charles, LL.D. (Aberd.), M.R.C.S., Hunterian Professor of Human and Comparative Anatomy, Royal College of Surgeons. 38, *Lincoln's Inn Fields*, W.C.
June 1, 1893.				Stirling, Edward Charles, C.M.G., M.D., F.R.C.S., Lecturer on Physiology in the University of Adelaide. *The University, Adelaide, South Australia.*
June 5, 1851.	'54–92	SEC. '54–85 PRES. '85–90 V.P. '90–92	C. Rm.	Stokes, Sir George Gabriel, Bart., M.A., D.C.L., LL.D., Lucasian Professor of Mathematics in the University of Cambridge. *Lensfield, Cambridge; and Athenæum Club*, S.W.
June 2, 1881.				Stoney, Bindon Blood, LL.D., M. Inst. C.E. 14, *Elgin-road, Dublin.*
June 6, 1861.	'98–1900	V.P. '99–1900		Stoney, George Johnstone, M.A., D.Sc. 8, *Upper Hornsey-rise*, N.
June 1, 1854.	'72–74 '80–81 '84–86 '90–91	V.P. '80–81 '85–86	R.	Strachey, Sir Richard, Lieut.-General R.E., G.C.S.I., LL.D., Chairman Meteorological Council. 69, *Lancaster Gate, Hyde Park*, W.
Mar. 22, 1888.				Sudeley, Charles Douglas Richard Hanbury-Tracy, Lord. *Ormeley Lodge, Ham Common, Surrey.*
June 7, 1894.	1900–			Swan, Joseph Wilson, M.A., F.C.S. 58, *Holland-park*, W.
June 1, 1899.				Tanner, Henry William Lloyd, D.Sc. (Oxon.), Professor of Mathematics and Astronomy in the University College of South Wales. 27, *Cwrt-y-Fil-road, Penarth, Glamorgan.*
June 9, 1898.				Taylor, Henry Martyn, Fellow of Trinity College, Cambridge. *The Yews, Queens-road, Cambridge.*
June 7, 1888.				Teale, Thomas Pridgin, M.A., F.R.C.S. 38, *Cookridge-street, Leeds.*
June 5, 1890.	'99–	V.P. 1900–		Teall, J. J. H., M.A., F.G.S. 89, *Thurlow Park-road, West Dulwich*, S.E.; *and Geological Museum, Jermyn-street*, S.W.
Mar. 12, 1896.				Temple, Rt. Hon. Sir Richard, Bart., G.C.S.I. *Heath Brow, Hampstead Heath*, N.W.; *The Nash, Kempsey, Worcestershire.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 3, 1869.				Tennant, James Francis, Lieut.-General, R.E. C.I.E. 11, *Clifton-gardens, Maida-hill*, W.
June 3, 1880.	'86–88 96–97	V.P. '96–97		Thiselton-Dyer, Sir William Turner, K.C.M.G., C.I.E., M.A. (Oxon.), Director, Royal Gardens, Kew. *Royal Gardens, Kew.*
June 4, 1891.				Thompson, Silvanus Phillips, B.A., D.Sc., Principal and Professor of Physics in the City and Guilds of London Technical College, Finsbury. *Morland, Chislett-road, West Hampstead*, N.W.
June 3, 1897.				Thomson, John Millar, LL.D., F.C.S., Professor of Chemistry in King's College, London. 85, *Addison-road*, W.
June 12, 1884.	'89–91 '98–1900		R.	Thomson, Joseph John, M.A., Sc.D., Cavendish Professor of Experimental Physics, Cambridge. *Trinity College, Cambridge.*
June 1, 1893.				Thornycroft, John Isaac, M. Inst. C.E. *Eyot Villa, Chiswick Mall, Chiswick.*
June 1, 1876.	'90–91 '93–95 '99–	V.P. '94–95 FOR. SEC. '99–	R.	Thorpe, Thomas Edward, C.B., Sc.D., LL.D, Principal of the Government Laboratories. *Government Laboratories, Clement's-inn-passage, Strand*, W.C.; *and Athenæum Club*, S.W.
June 1, 1899.				Threlfall, Richard, M.A. 259, *Hagley-road, Edgbaston, Birmingham.*
June 3, 1869.				Thuillier, Sir Henry Edward Landor, General, R.A., C.S.I., F.R.G.S. *Tudor House, Richmond, Surrey; and Oriental Club*, W.
June 3, 1880.	'92–94			Tilden, William Augustus, D.Sc., F.I.C., Professor of Chemistry in the Royal College of Science, London. *The Oaks, Murray-road, Northwood, Middlesex.*
June 4, 1891.				Tizard, Thomas Henry, Captain R.N., C.B., F.R.G.S., Assistant Hydrographer to the Admiralty. *Hydrographic Department, Admiralty, Whitehall* S.W.
June 6, 1889.				Todd, Sir Charles, K.C.M.G., M.A., Postmaster-General, Superintendent of Telegraphs and Government Astronomer, South Australia. *The Observatory, Adelaide, South Australia.*
June 6, 1878.				Tomes, Charles Sissmore, M.A. 9, *Park-crescent, Portland-place*, W.
June 6, 1889.				Tomlinson, Herbert, B.A. 97, *Albert Bridge-road*, S.W.
June 1, 1893.				Trail, James William Helenus, A.M., M.D., Regius Professor of Botany in the University of Aberdeen. *The University, Aberdeen.*
June 2, 1881.				Traquair, Ramsay H., M.D., LL.D., Keeper of the Natural History Collections in the Museum of

Date of Election.	Member of Council.	Held Office.	Medals.	
				Science and Art, Edinburgh. 8, *Dean Park-crescent, Edinburgh.*
June 7, 1883.				Trimen, Roland, M.A., F.L.S., F.Z.S., late Curator of the South African Museum. 12, *Dorset-square*, N.W.
June 4, 1868.				Tristram, Rev. Henry Baker, D.D., LL.D., Canon of Durham. *College, Durham.*
June 3, 1897.				Trouton, Frederick Thomas, M.A., Sc.D., *Caerleon, Killiney, co. Dublin.*
June 3, 1897.				Turner, Herbert Hall, D.Sc., F.R.A.S., Savilian Professor of Astronomy in the University of Oxford. *University Observatory, Oxford.*
June 7, 1877.	'90–91			Turner, Sir William, K.C.B., M.B., D.C.L., President of the General Medical Council, Professor of Anatomy in the University of Edinburgh. 6, *Eton-terrace, Edinburgh; and Athenæum Club*, S.W.
June 1, 1899.				Tutton, Alfred E., B.Sc., F.C.S. 17, *Bardwell-road, Oxford.*
June 8, 1871.	'99–1900			Tylor, Edward Burnett, D.C.L., LL.D., Professor of Anthropology in the University of Oxford. *Museum House, Oxford.*
June 4, 1886.	'93–94			Unwin, W. Cawthorne, B.Sc., Mem. Inst. C.E., Professor of Engineering at the Central Technical College of the City and Guilds of London Institute. *Palace Gate-mansions*, 29, *Palace Gate, Kensington*, W.
June 7, 1894.				Veley, Victor Herbert, M.A., F.C.S. *University College; and* 20, *Bradmore-road, Oxford.*
June 7, 1883.				Venn, John, Sc.D. *Sefton House, Hardwick-road, Eastbourne.*
June 4, 1885.	'90–92			Vines, Sydney Howard, M.A., D.Sc., Sherardian Professor of Botany in the University of Oxford. *Headington-hill, Oxford.*
June 14, 1900.				Walker, James, D.Sc. (Edin.), Professor of Chemistry in University College, Dundee. 8, *Windsor-terrace, Dundee.*
June 1, 1893.			R. Dw.	Wallace, Alfred Russel, LL.D., D.C.L. *Corfe View, Parkstone, Dorset.*
June 2, 1892.				Waller, Augustus Désiré, M.D., Lecturer on Physiology at St. Mary's Hospital Medical School. 16, *Grove End-road*, N.W.
June 9, 1887.	'96–97			Walsingham, Thomas de Grey, Lord, M.A., LL.D., High Steward of the University of Cambridge. *Merton Hall, Thetford, Norfolk.*
June 7, 1888.	'95–96		R.	Ward, Harry Marshall, D.Sc., F.L.S., Professor of Botany in the University of Cambridge. *Botanical Laboratory, New Museums, Cambridge.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 4, 1886.				Warington, Robert, M.A., F.C.S., late Sibthorpian Professor of Rural Economy in the University of Oxford. *High Bank, Harpenden, St. Albans.*
June 12, 1884.				Warren, Sir Charles, Lieut.-General R.E., G.C.M.G., K.C.B. 10, *Wellington-crescent, Ramsgate; and Athenæum Club*, S.W.
June 2, 1881.				Watson, Rev. Henry William, D.Sc. *The Rectory, Berkeswell, Coventry.*
June 14, 1900.				Watts, Philip. 11, *Windsor-crescent, Newcastle-on-Tyne.*
June 5, 1890.	'96–98			Weldon, Walter Frank Raphael, M.A., Linacre. Professor of Human and Comparative Anatomy in the University of Oxford. *Merton Lea, Oxford.*
June 4, 1886.	'88–89 '95–97		R.	Wharton, Sir William James Lloyd, Rear-Admiral, K.C.B., F.R.G.S., Hydrographer of the Admiralty. *Florys, Prince's-road, Wimbledon-park; and Athenæum Club*, S.W.
June 9, 1887.				Whitaker, William, B.A., F.G.S. *Freda, Campden-road, Croydon.*
June 7, 1888.	'94–95			White, Sir William Henry, K.C.B., LL.D., Assistant Controller and Director of Naval Construction. 39, *Roland Gardens*, S.W.; *and Athenæum Club*, S.W.
June 4, 1886.				Wilde, Henry, D.Sc., Past Pres. Lit. and Phil. Soc. Manch., Hon. Mem. Inst. Elect. Eng. *The Hurst, Alderley Edge, Cheshire.*
June 2, 1870.	'99–1900			Wilks, Sir Samuel, Bart., M.D., LL.D., Consulting Physician to Guy's Hospital. 72, *Grosvenor-street*, W.
June 5, 1862.				Williams, C. Greville, F.C.S., F.I.C. 36, *Kenilworth-avenue, Wimbledon*, S.W.
June 7, 1855.	'59–61 '69–71 '73–90	FOR. SEC. '73–89 V.P. '89–90		Williamson, Alexander William, D.C.L., LL.D., Emeritus Prof. of Chemistry in Univ. Coll. Lond. *High Pitfold, Shottermill, Haslemere.*
June 12, 1879.				Williamson, Benjamin, M.A., D.Sc., D.C.L. (Oxon.), Senior Fellow of Trin. Coll., Dublin. *Trinity College, Dublin.*
June 14, 1900.				Wilson, Charles Thomson Rees, M.A. *Sidney Sussex College, Cambridge.*
June 4, 1874.	'89–90			Wilson, Sir Charles William, Major-General, R.E., K.C.B., K.C.M.G., D.C.L. *Athenæum Club*, S.W.
June 7, 1855.				Wilson, George Fergusson, F.C.S., F.L.S. *Heatherbank, Weybridge Heath, Surrey.*
June 4, 1896.				Wilson, William E. *Daramona, Streete, Rathowen.*

Date of Election.	Member of Council.	Held Office.	Medals.	
June 9, 1898.				Wimshurst, James, M.Inst.E.E., 7, *Crescent-grove, Clapham-common*, S.W.
June 1, 1899.				Windle, Bertram Coghill Alan, M.A., M.D., Sc.D. (Dublin), Professor of Anatomy and Dean of the Medical Faculty, University of Birmingham. *Weatherbury, Harborne, Birmingham.*
June 13, 1895.				Wolfe Barry, Sir John, K.C.B., V.P. Inst. C.E. 23, *Delahay-street, Westminster*, S.W.
June 12, 1873.				Woodward, Henry, LL.D., F.G.S., Keeper of the Department of Geology, British Museum (Natural History), Cromwell-road, S.W. 129, *Beaufort-street, Chelsea*, S.W.
June 4, 1896.				Woodward, Horace Bolingbroke, F.G.S. 8, *Inglewood-road, West Hampstead*, N.W.; *and Geological Survey Office, Jermyn-street*, W.
June 1, 1893.				Worthington, Arthur Mason, M.A., F.R.A.S., Headmaster and Professor of Physics, Royal Navy Engineering College, Devonport. *Mohuns, Tavistock.*
June 4, 1896.				Wynne, William Palmer, D.Sc., Assistant Professor of Chemistry in the Royal College of Science. *Royal College of Science, South Kensington*, S.W.
June 6, 1889.				Yeo, Gerald Francis, M.D., F.R.C.S., Emeritus Professor of Physiology in King's College, London. *Bowden, Totnes, South Devon.*
June 1, 1893.				Young, Sydney, D.Sc., F.C.S., Professor of Chemistry in University College, Bristol. 10, *Windsor-terrace, Clifton, Bristol.*

FOREIGN MEMBERS.

		Elected
	Agassiz, Alexander. *Cambridge, Mass., U.S.A.*	1891.
	Amagat, Emile Hilaire. *École Polytechnique, Paris*	1897.
	Auwers, Georg Friedrich Julius Arthur, *Lindenstrasse*, 91, *Berlin*	1879.
	Baeyer, Adolf von. *Universität, Munich*	1885.
C.D.	Berthelot, Marcellin. *Secrétariat de l'Institut, Paris*	1877.
	Boltzmann, Ludwig. *Vienna*	1899.
C.D.	Cannizzaro, Stanislao. *Reale Università, Roma*	1889.
	Chauveau, Jean Baptiste Auguste. *Avenue Jules Janin*, 10, *Paris*	1889.

		Elected.
	Cornu, Alfred. *Rue de Grenelle, 9, Paris*	1884.
Rm.	Cremona, Luigi. *S. Pietro in Vincoli, Rome*	1879.
	Dohrn, Anton. *Naples*	1899.
	Fischer, Emil. *Berlin*	1899.
	Gaudry, Albert. *Rue des Saints-Pères, 7 bis, Paris*	1895.
C.	Gegenbaur, Carl. *Leopoldstrasse, 57, Heidelberg*	1884.
	Gibbs, J. Willard, *Yale College, New Haven, Conn.*	1897.
	Heim, Albert. *Hochschule, Zürich*	1896.
	Hermite, Charles. *Rue de la Sorbonne, 2, Paris*	1873.
	Hoff, J. H. van't. *Universität, Berlin*	1897.
Rm.	Janssen, Pierre Jules César. *Observatoire de Meudon, Paris*	1875.
	Klein, Felix. *Weender Chaussee, 6, Göttingen*	1885.
	Koch, Dr. Robert. *Universität, Berlin*	1897.
	Kohlrausch, Friedrich. *Physikalisch-Technische Reichsanstalt, Berlin*	1895.
C.	Kölliker, Albert von. *Universität, Würzburg*	1860.
	Kowalewski, Alexsandr. *Odessa, Russia*	1885.
	Lacaze-Duthiers, Henri de. *Faculté des Sciences, Paris*	1897.
	Langley, Samuel P. *Smithsonian Institution, Washington, U.S.A.*	1895.
	Lippmann, Gabriel. *Faculté des Sciences à la Sorbonne, Paris*	1896.
	Mascart, Éleuthère Élie Nicolas. *Rue de l'Université, 176, Paris*	1892.
D.	Mendeleeff, Dmitri Ivanovitch. 19, *Zabalkansky, St. Petersburg*	1892.
	Metschnikoff, Elias. *Institut Pasteur, Paris*	1895.
	Mittag-Leffler, Gösta. *Högskolan, Stockholm*	1896.
	Neumayer, Georg. *Hamburg*	1899.
C.	Newcomb, Simon. 1620, *P Street, Washington, U.S.A.*	1877.
	Pfeffer, Wilhelm. *Universität, Leipzig*	1897.
	Pflüger, Eduard Friedrich Wilhelm. *Universität, Bonn, Germany*	1888.
	Poincaré, Henri. *École Polytechnique, Paris*	1894.
	Quincke, Georg Hermann. *Friedrichsbau, Heidelberg*	1879.
	Rowland, Henry A. *Johns Hopkins University, Baltimore, U.S.A.*	1889.
	Schiaparelli, Giovanni. *R. Osservatorio Astronomico di Brera, Milan*	1896.
	Strasburger, Eduard. *Universität, Bonn*	1891.
	Struve, Otto Wilhelm. *Fahnstrasse, 8, Carlsruhe, Germany*	1873.
	Suess, Eduard. *Geologisches Museum, Vienna*	1894.
Rm.	Tacchini, Pietro. *Ufficio Meteorologico Centrale, Roma*	1891.
	Treub, Melchior. *Buitenzorg*	1899.
C.	Virchow, Rudolf. *Universität, Berlin*	1884.
D.	Wislicenus, Johannes. *Universität, Leipzig*	1897.
	Zirkel, Ferdinand. *Universität, Leipzig*	1897.

FELLOWS DECEASED BETWEEN THE ANNIVERSARY NOVEMBER 30, 1899, AND JANUARY 1, 1901.

Royal.

H.R.H. The Duke of Saxe Coburg and Gotha.

On the Home List.

Acland, Sir Henry Wentworth Dyke, Bart., K.C.B.
Anderson, John, M.D.
Argyll, George Douglas Campbell, Duke of, K.G., K.T.
Armstrong, William George, Lord.
Conroy, Sir John, Bart.
Hughes, David Edward.
Lawes, Sir John Bennet, Bart., D.C.L.
Lowe, Edward Joseph, F.R.A.S.
Marcet, William, M.D.
Mivart, St. George, Ph.D.
Paget, Sir James, Bart., D.C.L.
Pitt-Rivers, Augustus Henry Lane-Fox, Lieut.-General, D.C.L.
Pole, William, Mus. Doc.
Preston, Prof. Thomas, M.A.
Symons, George James.
Thorne, Sir Richard Thorne, K.C.B.
Walker, John James, M.A.

On the Foreign List.

Bertrand, Joseph Louis François.
Kühne, Willy.

Change of Name and Title.

Lindley, Sir Nathaniel, *to* Lindley, Lord.
Lubbock, Sir John, Bart., *to* Avebury, Lord.

FELLOWS ELECTED BETWEEN THE ANNIVERSARY NOVEMBER 30, 1899, AND JANUARY 1, 1901.

1900. June 14. Burch, George James, M.A.
1900. June 14. David, Prof. T. W. Edgeworth, B.A.
1900. June 14. Farmer, Prof. John Bretland, M.A.
1900. June 14. Hill, Leonard, M.B.
1900. June 14. Horne, John, F.G.S.
1900. June 14. Lister, Joseph Jackson, M.A.
1900. June 14. MacGregor, James Gordon, D.Sc.
1900. June 14. Manson, Patrick, C.M.G., M.D.
1900. June 14. Muir, Thomas, M.A.
1900. June 21. North, Right Hon. Sir Ford.
1900. Nov. 22. Northumberland, Duke of, K.G.
1900. June 14. Rambaut, Arthur Alcock, M.A.
1899. Dec. 16. Romer, Right Hon. Sir Robert, M.A.
1900. June 14. Sell, William James, M.A.
1900. June 14. Spencer, Prof. W. Baldwin, B.A.
1900. June 14. Walker, Prof. James, D.Sc.
1900. June 14. Watts, Philip.
1900. June 14. Wilson, Charles Thomson Rees, M.A.

COMMITTEES, 1901.

"Chairman," as used below, is to be understood as the Fellow appointed to act as Chairman in the absence of the President, who by Statute presides at all Meetings of Committees.

The Treasurer, Secretaries, and Foreign Secretary shall be considered as ex officio *members of all Committees (excepting the Scientific Relief Committee, the Sectional Committees, and any Committees composed of representatives of the Royal and other Societies jointly).*

Each Committee shall have power to add to its number, provided that any persons so added, if not Fellows of the Royal Society, shall be called "accessory members."

SECTIONAL COMMITTEES.

1. Mathematics Committee :—

(Two to retire each year.)

Chairman—Prof. Forsyth.

	To serve.			
Prof. Burnside	1 year.	Retires	Dec.,	1901.
„ Forsyth.....	1 „	„	„	„
Dr. Routh	2 years.	„	„	1902.
Prof. Lamb.....	2 „	„	„	„
„ G. H. Darwin	3 „	„	„	1903.
„ Elliott	3 „	„	„	„

2. Physics and Chemistry Committee :—

(Four to retire each year.)

Chairman—Prof. Clifton.

	To serve.			
Mr. Shelford Bidwell.....	1 year.	Retires	Dec.,	1901.
Mr. Boys	1 „	„	„	„
Prof. Meldola.....	1 „	„	„	„
Sir G. G. Stokes	1 „	„	„	„
Mr. Dunstan	2 years.	„	„	1902.
Prof. Fleming	2 „	„	„	„
„ Turner	2 „	„	„	„
„ Lodge	2 „	„	„	„
„ Callendar	3 years.	„	„	1903.
„ Clifton	3 „	„	„	„
„ J. J. Thomson.....	3 „	„	„	„
Dr. Wynne.....	3 „	„	„	„

3. Geology Committee :—

(Three to retire each year.)

Chairman—Dr. Blanford.

	To serve.			
Dr. Blanford	1 year.	Retires	Dec.,	1901.
Gen. McMahon	1 „	„	„	„
Adm. Sir W. J. L. Wharton	1 „	„	„	„
Dr. Hinde	2 years.	„	„	1902.
Prof. Judd	2 „	„	„	„
Adm. Sir G. S. Nares	2 „	„	„	„
Prof. Bonney	3 „	„	„	1903.
Sir A. Geikie	3 „	„	„	„
Prof. Lapworth	3 „	„	„	„

4. Botany Committee :—

(Three to retire each year.)

Chairman—Mr. F. Darwin.

	To serve.			
Mr. Baker	1 year.	Retires	Dec.,	1901.
Mr. Gardiner	1 „	„	„	„
Prof. J. R. Green	1 „	„	„	„
Mr. Carruthers	2 years.	„	„	1902.
Mr. F. Darwin	2 „	„	„	„
Prof. Vines	2 „	„	„	„
„ Balfour	3 „	„	„	1903.
Mr. G. Murray	3 „	„	„	„
Mr. Seward	3 „	„	„	„

5. Zoology Committee :—

(Three to retire each year.)

Chairman—Prof. Herdman.

	To serve.			
Dr. Gadow	1 year.	Retires	Dec.,	1901.
Prof. Howes	1 „	„	„	„
Dr. Sharp	1 „	„	„	„
Mr. Boulenger	2 years.	„	„	1902.
Prof. Herdman	2 „	„	„	„
„ Poulton	2 „	„	„	„
Mr. Bateson	3 „	„	„	1903.
Prof. Lankester	3 „	„	„	„
Rev. T. R. R. Stebbing	3 „	„	„	„

6. Physiology Committee :—

(Four to retire each year.)

Chairman—Prof. Halliburton.

	To serve.			
Sir J. Crichton Browne...	1 year.	Retires	Dec.,	1901.
Dr. Gaskell	1 „	„	„	„
Prof. Halliburton	1 „	„	„	„
Dr. Sidney Martin.....	1 „	„	„	„
Prof. Bradford	2 years.	„	„	1902.
Dr. Haldane	2 „	„	„	„
„ Mott	2 „	„	„	„
Prof. Starling.....	2 „	„	„	„
Dr. L. Hill	3 „	„	„	1903.
„ Langley	3 „	„	„	„
„ Pavy	3 „	„	„	„
Sir J. Burdon-Sanderson..	3 „	„	„	„

STANDING AND OCCASIONAL COMMITTEES.

Library Committee.

Chairman—Prof. Carey Foster.

Prof. W. Grylls Adams, Prof. Bonney, Mr. Christie, Prof. Carey Foster, Prof. Greenhill, Prof. Halliburton, Prof. McLeod, Dr. H. Müller, Prof. A. Newton, Prof. D. Oliver, Dr. Sclater, and Prof. S. P. Thompson, with power to add to their number, and with power to order books to an amount not exceeding £250, and to expend a sum not exceeding £150 in binding books belonging to the Society.

Soirée Committee.

Chairman—Sir W. Roberts-Austen.

Mr. Boys, Prof. Callendar, Sir W. Crookes, Sir J. Evans, Mr. W. Gardiner, Prof. Howes, Prof. Lankester, Dr. Mond, Dr. H. Müller, Prof. Perry, Sir W. H. Preece, Sir W. C. Roberts-Austen, Dr. Sclater, Dr. R. H. Scott, and Dr. H. Woodward, of whom three, to be determined by least attendance, retire annually.

House Committee.

Chairman—The Treasurer.

Prof. Ayrton, Prof. Ewing, Sir W. H. Preece, and Prof. S. P. Thompson (with the Treasurer as Vice-Chairman).

CATALOGUE OF SCIENTIFIC PAPERS COMMITTEE.

Chairman—Sir John Evans.

Prof. Armstrong, Sir John Evans, Prof. Judd, Dr. Klein, Sir J. N. Lockyer, Prof. McKendrick, Mr. McLachlan, Prof. McLeod, Dr. Mond, Prof. A. Newton, Sir W. H. Preece, Sir W. C. Roberts-Austen, Dr. Routh, Dr. D. H. Scott, and Prof. Tilden.

"CHALLENGER" COMMITTEE.

Chairman—Sir J. D. Hooker.

Sir J. D. Hooker, Prof. Lankester, Sir J. Murray, and Sir W. T. Thiselton-Dyer.

SCIENTIFIC RELIEF COMMITTEE.

Chairman—Mr. W. H. M. Christie.

Mr. J. G. Baker, Prof. Bonney, Sir T. L. Brunton, Mr. Christie, Major MacMahon, Dr. Mond, Prof. A. Newton, Dr. Pye-Smith, Dr. R. H. Scott, and Prof. Tilden.

JOINT PERMANENT ECLIPSE COMMITTEE.

(On the part of the Royal Society.)

Sir W. de W. Abney, Mr. Christie, Dr. Common, Sir J. N. Lockyer, Major MacMahon, Prof. Schuster, Sir G. G. Stokes, Dr. G. J. Stoney, Gen. Tennant, Dr. Thorpe, and Adm. Sir W. J. L. Wharton.

CORAL REEF COMMITTEE.

Chairman—Prof. Bonney.

Prof. Armstrong, Prof. Bonney, Sir W. Crookes, Mr. F. Darwin, Sir J. Evans, Capt. A. M. Field, Sir A. Geikie, Prof. Judd, Prof. Lankester, Prof. Lapworth, Sir J. Murray, Prof. Sollas, Dr. Sorby, Mr. Teall, Prof. W. W. Watts, Adm. Sir W. J. L. Wharton, and Sir J. Wolfe Barry.

TSETSE FLY COMMITTEE.

Chairman—Lord Lister.

Prof. Bradford, Sir J. Kirk, Prof. Lankester, Lord Lister, and Sir J. Burdon-Sanderson, with Mr. Plimmer as accessory member.

EVOLUTION COMMITTEE.

Chairman—Mr. F. D. Godman.

Mr. W. Bateson, Mr. Burbury, Mr. F. Darwin, Prof. Ewart, Mr. F. D. Godman, Prof. Lankester, Prof. Macalister, Mr. McLachlan, Dr. Masters, and Prof. Poulton, with Sir E. Clarke, Mr. W. Heape, and Prof. Somerville as accessory members.

GOVERNMENT GRANT REVIEW COMMITTEE.

Chairman—Dr. H. Müller.

Prof. Bonney, Prof. Halliburton, Dr. H. Müller, Mr. W. D. Niven, Prof. Reinold, Dr. Russell, and Dr. D. H. Scott.

OBSERVATORIES COMMITTEE.

Chairman—The Astronomer Royal.

The Astronomer Royal, the President of the Royal Astronomical Society, Sir W. de W. Abney, Prof. G. H. Darwin, Sir J. N. Lockyer, Sir G. G. Stokes, and Gen. Sir R. Strachey.

MALARIA COMMITTEE.

Chairman—Lord Lister.

Prof. Clifford Allbutt, Prof. Bradford, Sir J. Kirk, Prof. E. R. Lankester, Lord Lister, Dr. Manson, and Sir J. Burdon-Sanderson, with Mr. C. P. Lucas of the Colonial Office.

FINANCE COMMITTEE.

Chairman—The Treasurer.

Sir R. Giffen, Dr. Mond, Dr. Müller, Dr. R. H. Scott, Mr. J. W. Swan, and the Treasurer.

INDIAN GOVERNMENT ADVISORY COMMITTEE.

Chairman—Gen. Sir R. Strachey.

Dr. Blanford, Mr. H. T. Brown, Gen. Sir R. Strachey, Sir W. T. Thiselton-Dyer, and Prof. H. M. Ward.

JOINT ANTARCTIC COMMITTEE.

(On the part of the Royal Society.)

The President, The Treasurer, Sir M. Foster, Prof. Rücker, Dr. A. Buchan, Mr. J. Y. Buchanan, Capt. Creak, Sir J. Evans, Sir A. Geikie, Prof. Herdman, Sir J. D. Hooker, Prof. Poulton, Mr. P. L. Sclater, Mr. J. J. H. Teall, Capt. Tizard, and Adm. Sir W. J. L. Wharton.

ASTRONOMICAL PAPERS COMMITTEE.

Mr. W. H. M. Christie, Mr. H. T. Brown, Prof. Dewar, and Prof. J. J. Thomson.

GEODETIC ARC COMMITTEE.

Mr. W. H. M. Christie, Prof. G. H. Darwin, Sir D. Gill, and Sir C. Wilson, with Sir J. Ardagh as accessory member.

HUGHES BEQUEST COMMITTEE.

Prof. G. C. Foster, Sir A. Noble, Sir W. H. Preece, Sir W. C. Roberts-Austen, Prof. J. J. Thomson, and Mr. J. W. Swan.

STATUTES OF THE ROYAL SOCIETY.

CONTENTS.

CHAPTER I.

Of the Election and Admission of Fellows.

I. No person shall be proposed, elected, or admitted a Fellow of the Society on the day of the Anniversary Meeting for electing the Council and Officers.

II. Every Fellow, previously to his proposing a person as a Candidate for Election, shall inform him of the Obligation to be subscribed, of the sum to be paid for admission money, and of the payments to be made to the Society, before he can be admitted a Fellow.

III. Every such Candidate shall be proposed and recommended by a certificate in writing signed by six or more Fellows, of whom three at least shall certify their recommendation from personal knowledge. The certificate shall specify the name, rank, profession, qualifications, and usual place of residence of the Candidate; and being delivered to one of the Secretaries, or to the Assistant Secretary,

shall be registered, with the date of delivery, in a book to be kept for the purpose, and read at the next ordinary meeting; and, if so ordered, shall be suspended in some convenient place in the apartments of the Society until the day of election.

IV. Any one of Her Majesty's subjects who is a Prince of the Blood Royal may, nevertheless, be proposed at one of the Ordinary Meetings of the Society by any Fellow, and may be put to the vote for Election on the same day, provided public notice of such proposition shall have been given by the proposer at the preceding Meeting of the Society.

Any Member of Her Majesty's Privy Council may be proposed at any Ordinary Meeting by means of a certificate prepared in accordance with Statute III of this Chapter, no distinction, however, being made between personal and general knowledge, and the fact of the Candidate being a Member of the Privy Council being alone stated as the qualification. Such certificate, on being allowed by the Society, shall be suspended in some convenient place in the apartments of the Society until the day on which a ballot is taken upon it. The date proposed for the ballot, which shall not be earlier than the third Ordinary Meeting after that at which the certificate is read, shall be announced at the head of the certificate.

V. At the first Ordinary Meeting of the Society in March, the names of all Candidates proposed subsequently to the first Meeting in March of the preceding year, including those whose certificates have been resuspended as hereinafter provided, shall be announced by the Secretary from a list arranged in alphabetical order, without reference to the dates of the certificates of the Candidates; and these certificates shall remain suspended until the day of Election.

VI. In the first week in April, a list shall be printed, containing the names of all the Candidates so announced at the first Meeting in March, arranged in alphabetical order, without reference to the dates of the certificates, together with the names of the Fellows by whom each candidate is proposed and recommended; and a copy of such list shall immediately thereafter be sent to every Ordinary Fellow.

VII. The Council shall select by ballot from such printed list of Candidates a number not exceeding fifteen, to be recommended to the Society for Election; but no such selection by the Council shall be valid unless eleven Members at least be present and vote, a majority deciding, or in the event of equality the President having a second or casting vote.

VIII. At the first Ordinary Meeting of the Society in May, the

President shall read from the Chair the names of the Candidates whom the Council have selected as most eligible, arranged in alphabetical order; and after such Meeting, a circular letter shall be forthwith sent to every Fellow, naming the day and hour of Election, and inclosing a printed list of the selected Candidates, with space for such alterations as any Fellow may determine to make in pursuance of Statute X of this Chapter.

IX. The election of Ordinary Fellows not included in the privileged classes referred to in Statute IV of this Chapter, shall take place on the first Thursday of June; unless the Council shall alter the day of Election to any other day in the month of June, in which case due notice of such alteration shall be given to every Ordinary Fellow.

X. On the day of Election two Scrutators shall be nominated by the President, with the approbation of the Society, to assist the Secretaries in examining the lists; and each Fellow present and voting, shall deliver to one of the Secretaries or Scrutators one of the printed lists mentioned in Statute VIII of this Chapter, having erased the name of any Candidate or Candidates for whom he does not vote, and, if he shall have thought fit, having substituted or added the name of any other Candidate or Candidates contained in the printed list sent in pursuance of Statute VI of this Chapter.

XI. One of the Secretaries shall take down the names of the Fellows who vote, and the Scrutators, after examining the lists with he Secretaries, shall report to the President the names of the Candidates who shall have been duly elected in compliance with the Charters, and the President shall announce those names from the Chair.

XII. Any Candidate announced at the first Ordinary Meeting of the Society in March, as aforesaid, who shall not have been elected, shall, if his proposers, or any one of them, so request in writing, continue a candidate; his name shall be placed in alphabetical order with those of the new Candidates to be announced in March following, and his certificate shall be suspended along with those of the new Candidates. Any additional qualifications of such a Candidate may be set forth in a supplementary certificate to be signed by not fewer than six Fellows.

XIII. Every person who is elected a Fellow shall appear for his admission on or before the fourth Ordinary Meeting of the Society after the day of his Election, or within such further time as shall, for some sufficient cause, be granted by the Council; otherwise his election shall be void.

XIV. The admission of any Fellow into the Society shall be at some Ordinary Meeting, in manner and form following, he having first made the payments required by the Statutes. Immediately after the reading of the Minutes has been concluded, he shall subscribe the Obligation in the Charter-book, and be introduced to the President, who, taking him by the hand, shall say these words: *I do, by the authority and in the name of the Royal Society of London, for improving natural knowledge, admit you a Fellow thereof.*

XV. The Election, the payments made previous to admission, and the admission of every person into the Society, with the time thereof, shall be recorded in the Journal-book.

XVI. No person shall be deemed a Fellow of the Society until he has made the payments required by the Statutes: nor shall he be entitled to vote at any Election or Meeting of the Society until he shall have been admitted in the manner and form above specified.

XVII. Persons may be elected into the Society, under the title of Foreign Members, who are neither natives nor inhabitants of Her Majesty's dominions, and shall be exempted from the operation of Chapters II and III of these Statutes; they shall be selected from among men of the greatest eminence for their scientific discoveries and attainments.

XVIII. The Council shall from time to time, as they shall see fit, put in nomination persons for Election as Foreign Members, not exceeding, with those already elected, the number of fifty.

XIX. A book shall be kept in which Members of the Council may enter the names of those men of science whom they suggest as Foreign Members; each entry shall be signed by the proposer and be accompanied by a short statement of the principal grounds on which the suggestion is made, and shall be valid for three years only.

XX. When vacancies are to be filled up, a list of the persons so entered shall be sent to each Member of the Council, together with notice of the Meeting at which the list will be considered. At the Meeting thus appointed further entries may be made, and the claims of those men of science whose names have been duly entered in the book shall be considered, and a selection of names shall be made, from among which the Council, at a subsequent Meeting to be then appointed, may make nominations to the Society.

XXI. At the second Meeting the selection of the Candidates to be

nominated shall be by ballot; when, if two-thirds of the Members of the Council present be in favour of the nomination of any Candidate, his name shall be proposed at the next Ordinary Meeting of the Society, and shall be put to the vote at the following Ordinary Meeting.

CHAPTER II.

Of the Obligation to be Subscribed.

EVERY person elected a Fellow of the Society shall, before his admission, subscribe the Obligation in the following words:—

We who have hereunto subscribed, do hereby promise each for himself, that we will endeavour to promote the good of the Royal Society of London, for improving natural knowledge, and to pursue the ends for which the same was founded; that we will be present at the Meetings of the Society, as often as conveniently we can, especially at the Anniversary Elections, and upon extraordinary occasions; and that we will observe the Statutes and Orders of the said Society. Provided, that whensoever any of us shall signify to the President under his hand, that he desireth to withdraw from the Society, he shall be free from this Obligation for the future.

And if any person elected shall refuse to subscribe the said Obligation, the election of that person shall be void.

CHAPTER III.

Of the Payments to be made by the Fellows to the Society.

I. EVERY person elected a Fellow of the Society shall, before he is admitted, pay the sum of *ten pounds* for admission money, the sum of *four pounds* for the year of his election, and the same sum annually in advance so long as he shall continue a Fellow of the Society. And if any such person shall refuse or fail to pay the said sums, he shall not be admitted, and his Election shall be void: except the said sums be remitted in whole, or in part, by special order of the Council. Provided always that, except in the case of Fellows elected under Statute IV of Chapter I, the admission fee of each Fellow shall be paid out of the Fee Reduction Fund, and shall not be demanded of the Fellow; and that, except in the case of Fellows elected under Statute IV of Chapter I, and Fellows elected before January, 1879, *one pound* of the annual contribution shall be paid out of the Fee Reduction Fund.

II. All who have or may become Fellows of the Society may at any time compound for their annual payments, by paying at once the sum of *sixty pounds*.

III. All Annual Contributions shall be considered to be due on the 25th day of March in each year. Every Fellow of the Society liable to an Annual Payment shall (previously to the 25th day of March in every year) bring or send the same to the Treasurer or the Assistant Secretary. And if any such Fellow, after notice sent by post to his usual address, in May, and again in September, shall fail to pay the same before the first day of October in each year, his name shall be suspended in the public Meeting-room of the Society as being in arrear, and shall continue so suspended until the sum due be paid. And if any such Fellow shall fail to pay his subscription on or before the first day of November in each year, no satisfactory reason having been assigned to the President and Council for such non-payment, he shall cease to be a Fellow of the Society. Provided, nevertheless, that on a solicitation for readmission being addressed to the President and Council by an individual so circumstanced, within the space of one year following St. Andrew's Day, the case of the individual so soliciting shall be stated by the President from the Chair, at one of the Ordinary Meetings of the Society, and the question of his readmission be put to the vote at the next Ordinary Meeting of the Society.

CHAPTER IV.

Of the Death or Recess of any Fellow.

THE Death or Recess of any Fellow of the Society shall be recorded in the Journal-book of the Society, and the names of such persons announced from the Chair, at the Anniversary Meeting for electing the Council and Officers.

CHAPTER V.

Of the Causes and Form of Ejection.

I. IF any Fellow of the Society shall contemptuously or contumaciously disobey the Statutes or Orders of the Society or Council; or shall, by speaking, writing, or printing, publicly defame the Society; or advisedly, maliciously, or dishonestly do anything to the damage, detriment, or dishonour thereof, he shall be ejected out of the Society.

II. Whensoever there shall appear to be cause for the ejection of any Fellow out of the Society, the subject shall be laid before the Council; and if a majority of the Council shall, after due deliberation, determine by ballot to propose to the Society the ejection of the said Fellow, the President shall in that case, at some Ordinary Meeting of

the Society, announce from the Chair such determination of the Council; and at the Ordinary Meeting next after that at which the said announcement has been made, the Society shall proceed to determine the question; and on its appearing that two-thirds of the Members present have voted for the ejection of the said Fellow, the President shall proceed to cancel his name in the Register, and at the same time pronounce him ejected in these words:—

I do, by the authority and in the name of the Royal Society of London, for improving natural knowledge, declare A. B. to be now ejected, and no longer a Fellow thereof.

And the ejection of every such person shall be then recorded in the Journal-book of the Society; and his name, as ejected, be also read at the next Anniversary Meeting for Elections.

CHAPTER VI.

Of the Election of the Council and Officers.

I. At the two Ordinary Meetings of the Society next preceding the day of the Anniversary Election, the President shall give notice of the said Election; and declare how much it imports the good of the Society, that such persons may be chosen into the Council, as are most likely to attend the Meetings and business of the Council, out of whom there may be made the best choice of a President and other Officers.

II. Every Fellow of the Society whose residence is known, shall have notice of the Anniversary Meeting for electing the Council and Officers for the year ensuing, by particular summons, which summons shall be sent to the place of residence of such Fellow, a week at the least before the day of Meeting, and shall be to this effect:—

These are to give notice, that on the day of the Council and Officers of the Royal Society *are to be elected for the year ensuing; at which Election your presence is expected, at of the clock in the precisely.*

III. The Council for the ensuing year, out of which shall be chosen the President, Treasurer, Principal Secretaries, and Foreign Secretary, shall consist of eleven Members of the existing Council, and of ten Fellows who are not Members of the existing Council.

IV. The President and Council shall, previous to the Anniversary Meeting, nominate, by ballot, eleven Members of the existing Council, and also ten Fellows, not Members of the existing Council, whom they recommend to the Society for Election into the Council for the

ensuing year. The President and Council shall, also, in like manner, nominate by ballot, out of the proposed Council, the persons whom they recommend to the Society for election to the offices of President, Treasurer, Principal Secretaries, and Foreign Secretary for the ensuing year.

V. At the Ordinary Meeting of the Society preceding the Anniversary Meeting, the names of such persons so recommended for election as Council and Officers for the ensuing year shall be announced from the Chair.

VI. Lists, with the names of the Fellows recommended by the President and Council, and having a blank column opposite for such alterations as any Fellow may wish to make, shall be prepared for the use of the Fellows, one week before the day of Election.

VII. Two Scrutators shall be nominated by the President, with the approbation of the Society, to assist the Secretaries in examining the lists.

VIII. Each Fellow voting, shall deliver his list to one of the Secretaries or Scrutators; and the name of each Fellow who shall so deliver in his list shall be noted by one of the Secretaries.

IX. The Scrutators, after examining the lists with the Secretaries, shall report to the Society the names of those having the majority of votes for composing the Council, and filling the offices of President, Treasurer, Principal Secretaries, and Foreign Secretary; the names of which persons shall then be announced from the Chair.

X. For electing any Member of the Council, or any Officer to be elected by the Society, upon such vacancies as shall happen in the intervals of the Anniversary Elections, the summons for such Election, and the proceedings in it, shall be after the same manner as is directed for the Anniversary Election.

XI. Upon any vacancy of the President's place, occurring in the intervals of the Anniversary Elections, the Treasurer, or, in his absence, one of the Secretaries, shall cause the Council to be summoned for the Election of a new President: and the Council meeting thereupon in the usual place, or any eleven or more of them, shall proceed to the said Election, and not separate until the major part of them shall have agreed upon a new President.

CHAPTER VII.

Of the President.

I. The business of the President shall be to preside at all the meetings, and regulate all the debates, of the Society, Council, and Committees; to state and put questions both in the affirmative and negative, according to the sense and intention of the meetings; to call for reports and accounts from Committees, and others; to check irregularities, and to keep all persons to order; to summon all Meetings of the Council, and Committee of Papers; and to execute, or see to the execution of, the Statutes of the Society.

II. The President shall take precedence of every Fellow of the Society, at their ordinary place of meeting; and also in all other places, where any number of the Fellows meet as a Society, Council, or Committee.

III. In the absence of the President, one of the Vice-Presidents shall act as his deputy, and may do, in the absence of the President, the same acts as the President himself could do if present.

CHAPTER VIII.

Of the Treasurer and his Accounts.

I. The Treasurer, or some person appointed by him, shall receive for the use of the Society, all sums of money due or payable to the Society; and shall pay and disburse all sums due from or payable by the Society; and shall keep particular Accounts of all such receipts and payments.

II. Every sum of money payable on account of the Society, exceeding Ten Pounds, shall be paid only by order of the Council; but payments for rates or taxes, to any amount, may be made by the Treasurer, without any specific order of the Council for that purpose.

III. All sums of money, which there shall not be present occasion for expending, or otherwise disposing of to the use of the Society, shall be laid out in such Government or other securities as shall be approved of and directed by the Council.

IV. The Treasurer shall keep a yearly account of all such Fellows of the Society as pay the sum appointed as the composition in lieu of annual payments; and also of those who make the annual payments: and in this account shall be noted the times up to which the annual payments have been made, and the arrears due from each Fellow.

V. The Treasurer shall also keep a book of Cheque Receipts for annual payments, to be filled up with the name of the Fellow paying, the sum paid, and the time for which payment is made; these Receipts to be signed by the Treasurer, or by the Assistant Secretary receiving the money on the Treasurer's behalf, who, upon the delivery of the Receipt to the Fellow paying, is to enter upon that part of the Cheque which is left in the Book, the above particulars, and also the day of payment.

VI. The Treasurer shall demand, or cause to be demanded, all arrears of annual payments, as soon as convenient after the first day of May.

VII. The Accounts of the Treasurer shall be audited annually, a short time preceding the Anniversary Elections, by a Committee consisting of three Members of the Council, of whom the President or one of the Secretaries to be one; and of three Fellows of the Society not Members of the Council, who are to be nominated by the President, with the consent of the major part of the Fellows present, given by ballot at one of the three next preceding weekly meetings; any one or more of the said three Members of the Council, together with any one or more of the said three Fellows, shall be a Quorum of the said Committee: the Members of the said Committee who are of the Council shall make their Report to the Council held next after such audit, on or before the Anniversary Election; and the Members of the said Committee who are not of the Council shall make their Report to the Society, upon the Meeting next before the Anniversary Election, or on the day of the said Election.

VIII. The Treasurer shall have the charge of the Title Deeds of the Society's Estates, the Policies of Insurance, and Securities.

IX. As soon after the Audit as may be, and before the Anniversary Meeting, the Treasurer shall cause an abstract of the Society's Accounts of the preceding year to be printed for the use of the Fellows.

CHAPTER IX.

Of the Secretaries.

I. The Secretaries, or one of them, shall have inspection over the Assistant Secretary; and shall give the Orders and Directions concerning the entering and writing of all minutes or matters in the Journal-books of the Society or Council, or any other Books of the Society; and also concerning any orders or other writings for the use and service of the Society.

II. The Secretaries, or one of them, shall attend all meetings of the Society, Council, and Committee of Papers; where, when the President has taken the Chair, one of the Secretaries shall read the minutes, orders, and entries of the preceding meeting; and shall afterwards take minutes of the business and orders of the present meeting, to be entered by the Assistant Secretary in the respective books to which they relate.

III. At the meetings of the Society, Lists of the Presents made from time to time to the Society shall be laid on the Table, by one of the Secretaries, for the inspection of the Fellows; and the thanks of the Society to the Donors shall be proposed from the Chair previously to the reading of the first Paper. One of the Secretaries shall give notice of any Candidate who stands proposed for election into the Society at that Meeting; and the Secretaries shall read Letters and Papers presented to the Society, in such manner as the President shall direct.

IV. The Secretaries shall draw up all letters to be written to any persons in the name of the Society or Council (to be read and approved of in some meeting of either respectively), except, for some particular cause or consideration, some other person be appointed by the Society or Council to draw up any such letter. They shall likewise have the charge (under the direction of the Committee of Papers) of printing the *Philosophical Transactions*, the *Proceedings*, and other Publications of the Society.

V. The letters relating to the business of the Society, received during each Session, shall be arranged and kept in the apartments of the Society.

VI. The duty of the Secretary for Foreign Correspondence shall be to receive and answer all letters from foreign parts relating to the business of the Society, to return thanks for Presents from Foreigners made to the Society, and to forward to persons elected Foreign Members the Diplomas certifying their election into the Society.

CHAPTER X.

Of the Assistant Secretary.

I. The person who shall be chosen to the office of Assistant Secretary, shall either not be a Fellow of the Society; or, if a Fellow, shall cease to be so upon his election to and acceptance of that office.

II. The appointment of a person to the office of Assistant Secretary shall be by the Council, to whom the Officer so appointed shall give security, at the discretion of the Council; and he shall reside in the Society's House.

III. The Assistant Secretary shall be paid for his services according to the determination of the Council; and shall not, besides such payments, receive any perquisite or profit whatsoever without the express permission of the President and Council. He shall be subject to such Rules and Orders as shall from time to time be made or given by the President and Council; and he shall constantly be in attendance during all meetings of the Society, Council, and Committees.

IV. He shall enter all the Minutes in the several Journal-books, and make an Index to every such book: he shall lay before every Council their fair Minute-book: and before every Committee of Papers, the Society's Journal-book, to show that the several entries are fairly made: and he shall have the care of the writing of all Summonses of the Society, Council, and Committees.

V. He shall, under the direction of the Secretaries, have the charge and custody of the Charter-book, Statute-book, Journal-books of the Society and Council, Register-books, and Letter-books, as also of all Papers and Writings belonging to the Society; all which shall be kept in the House of the Society, that they may be in readiness to be produced at any meetings of the Society or Council, as the case may require, or as shall be ordered by the Society, Council or President.

VI. He shall not suffer any person, not being a Fellow of the Society, to read any Journal-book, Record, or Writing, or any part thereof, belonging to the Society; nor give any copy thereof, nor in any way communicate anything contained therein, to any such person.

VII. He shall follow the directions which may be given him from time to time by the Treasurer in respect of that part of his duties which relates to the Accounts or Cash Transactions of the Society. He shall enter in a book, to be provided by the Treasurer, all such sums as he may receive on account of the Society at the instant of receiving such sums; and for these sums, so entered by him, he shall be answerable, until he shall have paid them to the Treasurer.

VIII. He shall attend the Library at such hours as shall be appointed for him for the accommodation of such Fellows of the Society

as shall come to read the printed books or manuscripts, and of any other person who shall be introduced by a Fellow, either personally or by letter.

IX. He shall mark with the stamp of the Society all books accepted or bought by the Society.

CHAPTER XI.

Of the Meetings of the Society.

I. The Session of the Society shall commence on the third Thursday in November, and end on the third Thursday in June.

II. The Ordinary Meetings of the Society shall be on Thursdays weekly (excepting Christmas, Passion, Easter, and Whitsun weeks, and such other weeks at Christmas and Easter, in each year, as the Council may in the preceding year determine, and also Ascension Day), and shall begin at half-past Four o'clock in the Afternoon precisely.

III. No stranger shall be permitted to be present during the Meeting, unless by invitation of the President, or by his leave or order upon the recommendation of some Fellow.

IV. The business of the Society in their Ordinary Meetings shall be to order, take account, consider, and discourse of philosophical experiments and observations; to read, hear, and discourse upon letters, reports, and other papers containing philosophical matters; as also to view, and discourse upon, rarities of nature and art: and thereupon to consider, what may be deduced from them, or any of them; and how far they, or any of them, may be improved for use or discovery.*

V. No letter, report, or other paper shall be read at any Ordinary Meeting unless it be communicated by a Fellow or Foreign Member; and it shall be the duty of each Fellow or Foreign Member to satisfy himself that any letter, report, or other paper which he may communicate, is suitable to be read before the Society.

VI. The conduct of the Ordinary Meetings shall be in accordance with the Standing Orders determined from time to time by the President and Council, provided always that at the Ordinary Meetings nothing relating to Statutes or management of the Society shall be brought forward or discussed.

* This is the wording of the Statute as given in the Statutes of 1663.

VII. The Anniversary Meeting for the election of the Council and Officers, and the Annual Meeting for the election of Fellows, shall take place at an hour to be determined by the Council.

CHAPTER XII.

Of Special General Meetings of the Society.

I. The President or Council may at any time call a Special General Meeting of the Society when it may appear to them to be necessary.

II. Any six Fellows may, by notice in writing, signed by them, and delivered to one of the Secretaries at an Ordinary Meeting of the Society, require a Special General Meeting of the Society to be convened, for the purpose of considering and determining on the matters specified in such requisition, and the Council shall, within one week after such requisition shall have been so delivered, appoint a day for a Special General Meeting accordingly.

III. One week's notice of any Special General Meeting shall be given to each Fellow resident in the United Kingdom, and such notice shall state the object of such Meeting.

IV. At such Meeting no business shall be brought forward except what shall have been so notified.

CHAPTER XIII.

Of the Publication of Papers.

I. The Members of the Council for the time being shall constitute and be a standing Committee, to be called the Committee of Papers, to whom the consideration of the acceptance, reading, and publication of all papers communicated to the Society shall be referred, and who shall execute their powers in accordance with Standing Orders determined from time to time by the President and Council.

II. The Committee of Papers shall meet at such times as shall be appointed by the President; due and sufficient notice of such meeting having been previously sent to every Member of the Committee.

The publication of papers communicated to the Society, and of such other matters as the President and Council may judge fit to publish, shall take place under Standing Orders determined from time to time by the President and Council, but always in such a way that a proper portion of them shall from time to time be printed and published under the title of the 'Philosophical Transactions of the

Royal Society of London,' and another proper portion under the title of the 'Proceedings of the Royal Society of London,' provided always that the President and Council shall have power to publish either papers or other matter in such form and under such conditions as they may from time to time determine.

III. At a meeting of the said Committee no less number than seven of the Members (of which number the President, or, in his absence, a Vice-President, shall always be one) shall be a quorum.

IV. The decisions of the Committee of Papers shall be determined by the majority of votes of those present and voting, and the voting shall be open, unless the President shall direct that the voting shall be by ballot. In case of an equality of votes, the President shall have a second or casting vote.

The decisions of the Committee shall be duly entered in the Minute-book of the Committee.

V. The *Philosophical Transactions* and the *Proceedings* shall be printed at the sole charge, and for the use and benefit, of the Society, and of the Fellows thereof; to the intent that each of the present Fellows, who actually contributes and pays towards the support of the Society, or who has compounded for such contribution, according to the rules and orders established in relation thereto, or who has for other particular reasons been exonerated and discharged from such contribution by order of the Council, may receive *gratis* (but under proper limitations and restrictions) one copy of such of the *Philosophical Transactions* and of the *Proceedings* as shall be printed as aforesaid; and that all persons who shall hereafter be admitted Fellows shall, under the same conditions, receive, and be entitled to, the like benefit and advantage.

VI. The Assistant Secretary shall deliver *gratis* one of the said copies of the *Transactions* to every Fellow of the Society (except as hereinafter excepted) who shall demand the same, either in person, or by letter.

Provided always, that no Fellow whatsoever of the Society shall be entitled to demand or receive any such copy of the *Transactions*, whose election and payment of Admission fees and regular Contributions shall not have preceded the date of the time appointed for the delivery of the said *Transactions;* neither shall the Executor of any deceased Fellow receive a copy of the *Transactions* published after the death of such Fellow.

Provided also, that no Fellow of the Society shall receive, or be entitled to receive, *gratis*, any copy or copies of the *Transactions*, so

printed as aforesaid, after five years shall have elapsed from the time of the Assistant Secretary's having begun to deliver out such copies respectively; but his neglecting to demand them for so long a time shall be deemed a forfeiture and dereliction of his right thereto: unless the Council for the time being, upon being made acquainted with the reason of such delay, and having regard to the circumstances of the application, and the amount of stock in hand, shall *order* such copies as they may think fit to be so delivered.

VII. The Assistant Secretary shall further cause to be distributed *gratis* to all the Fellows of the Society, by post or otherwise, copies of the *Proceedings* as soon as may be convenient after their appearance.

VIII. If the number of copies of *Transactions* and *Proceedings* so to be printed shall be greater than what will be requisite to supply each of the Fellows with one copy, such supernumerary copies shall be disposed of at such times, and in such manner, as the Council shall direct.

CHAPTER XIV.

Of the Books and Papers of the Society.

I. THERE shall be had and kept a Book, called the *Charter-book*, wherein shall be fairly written the copy of the Charters, all the Royal Grants on the behalf of the Society, and the Obligation to be subscribed by the Fellows of the Society in their own hand-writing.

II. There shall be kept a Book, called the *Statute-book*, wherein shall be fairly written, or printed, all the Laws, Statutes, and Constitutions made, or to be made, concerning the government and regulating of the Society or Council; and also a Register of the Fellows of the Society, with the times of their Election and Admission.

III. There shall be kept *Journal-books** of the Society, and also of the Council, wherein shall be entered all the minutes, orders, and business of the Society and Council at their respective meetings; to which Journal-books any Fellow may have access at such times as the Library is open.

IV. A Book shall be kept, in which the title of each communication received, the date of its reception at the apartments of the

* "The words 'Journal-books' do not include the Minute-books of the Government Grant Committee or those of the Government Grant Boards."—*Minute of Council, May* 24, 1894.

Society, and the name of the Fellow or Foreign Member who communicates it, shall be duly entered in the order of its reception.

V. The original copy of every Paper received at the Society shall be considered the property of the Society, if there be no previous engagement with its author to the contrary; but any author may withdraw a paper which has been received but not read; or may, by leave of the Council, have a copy of his paper; and it shall be in the power of the Council, if they think fit, to return to any author such drawings or other illustrations accompanying any paper communicated by him or on his behalf, which he may ask in writing to be returned to him.

VI. All the Papers not withdrawn by leave of the Council, and read at the Society, shall be delivered to the Committee of Papers; and all Papers which have not been printed in the *Transactions* or *Proceedings* shall be preserved in the archives of the Society for future inspection; and shall never be lent out of the Society's House without Order of the Council.

VII. The Library shall be open to the Fellows every week-day (exclusive of Good Friday and Easter-eve, of Easter week, of a week at Whitsuntide, and of a week at Christmas), from 11 A.M. to 6 P.M., except on Saturdays, when it shall be open from Eleven in the morning to One in the afternoon; but during the months of August and September it shall be closed on week-days, other than Saturdays, at 4 p.m.

VIII. Any Fellow may have the loan of any of the printed Books of the Society, excepting such as the Council shall order not to be taken out of the Library; but he shall not be allowed to have in his possession more than ten volumes at a time. The loan of Manuscripts is exclusively vested in the President and Council.

IX. A List of all Books and Manuscripts borrowed from the Library of the Royal Society, and of the Fellows of the Society to whom they are lent, shall be kept in the Library.

X. All Books whatsoever belonging to the Society shall be returned at a time to be specified by the Council, in each year; and the Library shall be closed for one month after such time, or for such shorter periods as the Council may direct.

XI. The value of such Books in the possession of any Fellow as are not returned to the Library pursuant to the preceding Statute, shall be required to be paid by the person who has so detained them.

CHAPTER XV.

Of the Common Seal and Deeds.

I. THE Common Seal of the Society shall be kept in a box, the key of which shall be kept in a sealed packet. When the Common Seal has to be used, this packet shall be opened by the President in Council; and at the Council meeting at which it is so opened, the Common Seal having been replaced in the box, and the box locked, the key shall again be enclosed in a packet, which shall be sealed by the President with his private seal. The box and sealed packet shall be kept at the Society's chambers in an iron safe.

II. Every Deed or writing, to which the Common Seal is to be affixed, shall be passed and sealed in Council.

CHAPTER XVI.

Of the Restraint of Dividends to Fellows.

THE Society shall not, and by its laws may not, make any Dividend, Gift, Division, or Bonus in Money unto or between any of its Members.

CHAPTER XVII.

Of the Making and Repealing of Laws.

I. FOR the making of any Law or Statute of the Royal Society, the draught thereof shall be read in Council, and put to the vote, on two several days of their meeting. The first day the question to be resolved by vote shall be to this effect, viz., "Whether the draught of the said Statute, then agreed upon, shall be read at another meeting?" The second day the question shall be to this effect, viz., "Whether the draught of the said Statute, then agreed upon, shall pass for a Law, or not?"

II. For the repealing of any Law or Statute, or any part thereof, the Repeal shall be proposed and voted in Council on two several days of their meeting. The first day the question to be resolved by Ballot shall be to this effect, viz., "Whether the Repeal of such a Statute, or such part thereof, shall be proposed at another meeting?" The second day the question shall be to this effect, viz., "Whether such a Statute, or such part thereof, shall be repealed, or not?" And in case the said Repeal be agreed unto, the same

shall be recorded in the Journal-book of the Council; and the Statute, or part of the Statute, repealed, shall be cancelled in the Statute-book.

January 1, 1897.

STANDING ORDERS OF COUNCIL RELATING TO MEETINGS, SECTIONAL COMMITTEES, AND PUBLICATIONS.

(*As amended Feb.* 16*th*, 1899.)

NOTE.

By Statute XIII, 1, the consideration of the acceptance, reading, and publication of all papers communicated to the Society is referred to the Council sitting as Committee of Papers; and in the following Standing Orders the word "Council," when used in connection with the acceptance, reading, or publication of papers, is to be understood to mean the Council sitting as Committee of Papers.

I.

Relating to the Conduct of Ordinary Meetings.

1. At each Ordinary Meeting, any formal business of the Society which may be necessary, such as the reading of certificates, balloting for candidates under Cap. I, Sec. IV, announcements, returning thanks for presents, &c., shall, unless the President direct otherwise, be the first business of the meeting.

2. At each Ordinary Meeting, not being "a Meeting for Discussion," as hereinafter provided, or for the Bakerian or the Croonian Lecture, the President shall determine what papers are to be read, and the order in which they shall be taken. He may also, whenever he sees fit, direct the author of a paper or one of the Secretaries to read an abstract of the paper or the paper itself, if it be sufficiently brief, or may invite the author to make an oral statement of the nature of its contents, and may also invite remarks upon the paper. When an oral statement is desired, the author shall, so far as possible, be previously informed of the fact. A paper shall be considered to have been "read" if one of the Secretaries has read its title only.

3. At any Ordinary Meeting, not being a "Meeting for Discussion," any Fellow of the Society may, with the approval of the President, and at such period of the Meeting as the President may determine, make a communication not of the nature of a "paper," or exhibit objects having relation to the advancement of Natural Knowledge.

4. The President shall further have power at any Ordinary Meeting, and at any period of that Meeting which he may think proper, to make such announcements or statements, as he may think desirable, relating to the advancement of Natural Knowledge.

5. In each year certain Ordinary Meetings, not more than four in number (exclusive of the Meetings set aside for the Bakerian and Croonian Lectures respectively), shall be devoted each to the hearing and consideration of some one important communication, or to the discussion of some important topic; these Meetings shall be termed "Meetings for Discussion."

6. The Council shall from time to time give due notice of the dates at which Meetings for Discussion will be held.

7. The Council, of its own motion, or upon the recommendation of a Sectional Committee, may select some communication made to the Society in the ordinary way, as the subject for such a Meeting for Discussion, or it may select for that purpose some question, the discussion of which would, in their judgment, be likely to advance Natural Knowledge. In the latter case, the Council shall appoint some person to open the discussion by means of a communication made by him for that purpose.

8. When a Meeting for Discussion has been arranged, the Council, or the Officers, shall direct printed copies of the communication which has been approved of for the said Meeting (or of an adequate abstract of it), to be sent not later than one week before the date of the Meeting, to each Fellow, or to certain Fellows of the Society, and to such other persons as the President may direct. And the Council shall take such other steps as may seem to it desirable to render the discussion useful towards the advancement of Natural Knowledge.

9. At each Meeting for Discussion, the conduct of the discussion shall be under the direction of the President, who shall arrange for the Fellows present and desiring to speak, and who shall have the power to invite, if he think fit, persons present, not Fellows of the Society, to take part in the discussion. Any Fellow shall be at liberty to send to the Secretaries, previous to the Meeting, written remarks on the communication which is the subject of the meeting, and the President shall, if he see fit, direct one or other of the Secretaries to read these remarks at the meeting.

II.

Relating to Sectional Committees.

10. The Council shall appoint, from among the Fellows of the Society, Committees representing the several branches of Natural Knowledge, and called "Sectional Committees." The Members of each Committee shall be chosen with a view to secure, so far as is possible, a representation of the several sub-divisions of each branch of Natural Knowledge, and to obtain the assistance of Fellows who, from their connection with other societies, and otherwise, are specially qualified to advise the Council in respect to particular parts of Natural Knowledge.

11. It shall be the business of each Sectional Committee to advise the Council (whether sitting as the Committee of Papers or otherwise) or the Officers upon matters referred to it by the Council or by the Officers, and otherwise to make to the Council such suggestions as it may think desirable touching the branch or branches of Natural Knowledge which it represents, it being understood that no Sectional Committee shall offer advice to the Council as to the selection of candidates for admission into the Society as Fellows or Foreign Members, or as to the awards of Medals, unless the Council shall have asked for such advice.

12. The Council shall each year appoint a Member of each Committee to serve as Chairman of that Committee, and to be the channel of communication between the Committee and the Council or Officers.

13. The Sectional Committees shall be six in number, viz.:—

(1) A "Mathematics" Committee for Mathematics, Mathematical Physics, Crystallography, and Mathematical Astronomy.
(2) A "Physics and Chemistry" Committee for Experimental Physics, Observational Astronomy, Meteorology, Chemistry, and Metallurgy.
(3) A "Geology" Committee for Geology, Palæontology, Mineralogy, and Geography.
(4) A "Botany" Committee for Botany.
(5) A "Zoology" Committee for Zoology and Comparative Anatomy.
(6) A "Physiology" Committee for (Animal) Physiology and Medical Subjects.

14. The "Mathematics" Committee shall consist of six Members, of whom two shall retire each year; three Members shall form a quorum.

The "Physics and Chemistry" Committee shall consist of twelve Members, of whom four shall retire each year; five Members shall form a quorum.

The "Geology" Committee shall consist of nine Members, of whom three shall retire each year; four Members shall form a quorum.

The "Botany" Committee shall consist of nine Members, of whom three shall retire each year; four members shall form a quorum.

The "Zoology" Committee shall consist of nine Members, of whom three shall retire each year; four members shall form a quorum.

The "Physiology" Committee shall consist of twelve Members, of whom four shall retire each year; five members shall form a quorum.

15. Any Member of Council who desires to attend the meetings of any Sectional Committee, of which he is not at the time being a Member, shall have power to do so as *amicus curiæ* under the following conditions. Upon his expressing in writing to the Assistant Secretary his wish so to attend, the summons for each meeting of the Committee shall be sent to him as to an ordinary Member of the Committee during his tenure of office as Member of Council, or during such shorter time as he may name; but the Chairman of the Committee shall not be expected to correspond with him as with an ordinary Member of Committee. He may with the consent of the Chairman speak during the deliberations of the Committee, but shall give no vote.

16. It shall be in the power of the Council to add to the number of any Committee, if at any time it may seem to be desirable to do so.

(*The following Standing Orders*, 17—28, *are the same for each Sectional Committee.*)

17. The retirement of Members shall be determined by seniority.

18. The retiring Members of the Committee shall each year vacate office on the 31st of December, and shall not be eligible for election for the ensuing year.

19. Should, by reason of death or otherwise, a vacancy occur at any intermediate time, the Council shall appoint a person to fill the vacancy, and the retirement of the person so appointed shall be according to the rules which would have applied to the Member whose place he fills, provided that, if at the date of retirement the said person has not served more than one year, he shall be eligible for immediate re-appointment.

20. The appointment of the Fellows to serve as new Members of Committee shall be made by the Council in December, and the

Members so appointed shall enter office upon the 1st of January ensuing.

21. The Committee shall, when necessary, meet in the apartments of the Society at some convenient hour on the second Thursday in each month from October to July, both included, or at such other times and places as the Chairman may determine.

22. The summonses for a meeting shall be issued by the Assistant Secretary at the direction of the Chairman.

23. The decisions arrived at by a meeting of a Committee at which the Members present do not form a quorum shall be valid, if subsequently agreed to in writing by not less than two-thirds of the whole Committee.

24. Voting shall be open, unless any Member of the Committee shall demand the ballot. The Chairman shall have a second or casting vote.

25. The Minutes of the Committee shall be duly recorded in a book kept for that purpose, and preserved in the apartments of the Society, or in the custody of the Chairman, together with such correspondence and documents relating to the business of the Committee as the Committee may think it desirable to preserve.

26. The Committee shall make to the Council, through its Chairman, who shall be provided by the Society with such clerkly assistance as he may need, reports to the Council, answers to inquiries of the Council, and such suggestions as the Committee may think desirable. The minutes of the Committee shall be laid before the Council whenever the Council shall so demand.

27. When a Committee is of opinion that a paper referred to it might profitably serve as the basis of a discussion at a meeting of the Society, it shall forthwith report to that effect to the Council. If the matter seem urgent, the President and Officers shall have power, without waiting for a Meeting of the Council, to take immediate steps towards carrying out the recommendations of the Committee.

28. Should, at any time, a Committee be of opinion that it would be desirable to encourage a discussion at a meeting of the Society upon some subject, concerning which no paper suitable to serve as a basis for discussion is under its consideration, and have ascertained that some person is willing to prepare a suitable paper for that purpose, the Committee, having approved of the said paper, shall recommend it to the Council, to be treated as the basis of a discussion to be held at some convenient meeting.

III.

Relating to the Acceptance, Reading, and Publication of Papers.

29. Upon a communicated paper reaching the apartments of the

Society, the Assistant Secretary shall mark on it the date of the reception, shall record the reception in the book kept for that and other purposes relating to papers received, and shall report the reception to the one or the other of the two Secretaries, according to the nature of the communication.

30. The Secretary to whom the paper is thus reported shall, if he sees fit, of himself, or after consultation with the other Officers or with the Chairman of the appropriate Sectional Committee, direct the paper to be marked as "accepted for consideration," otherwise he shall refer the question of acceptance for consideration to the appropriate Chairman of Sectional Committee, who shall at a meeting of his Committee, or by correspondence with its Members, obtain the view of the Committee thereupon, and report the same to the Secretary, who shall act on the advice so given.

31. In the case of a paper not being accepted for consideration, the Fellow communicating the paper shall be informed thereof, but the paper itself shall remain the property of the Society, provided always that such Fellow may, with the consent of the Council, withdraw the said paper, upon the understanding expressed in writing that the paper is to be regarded as not having been communicated to the Society at all.

As to the 'Proceedings.'

32. In the case of a paper being accepted for consideration, the author shall be required to furnish, if he has not already done so, a short account of the main points of the paper, hereinafter called an "abstract," of such length and nature as shall be approved of by the Secretaries; provided that if the paper do not exceed in length about twelve pages of the 'Proceedings' (such a paper being hereinafter called a "short" paper), an abstract of it shall not be required.

33. In the case of a paper accepted for consideration, and of which when required an abstract has been furnished, the Secretaries shall proceed to make arrangements for the reading of the paper, and shall, if they think fit, of themselves, or after consultation with the Chairman of the appropriate Sectional Committee, mark the abstract or short paper as suitable for publication in the 'Proceedings'; otherwise they shall refer the question of publication of the abstract, or in the case of a short paper, of the paper itself, to the Chairman of the appropriate Sectional Committee, who shall, either at a meeting of the Committee, or by correspondence with its Members, obtain the view of the Committee thereupon, and report the same to the Secretaries, who shall act upon the advice so given.

34. In all cases where the Secretaries have, as regards the acceptance or reading of any paper, or the publication of any abstract or

paper, acted under Standing Order 30, or 33, of themselves, or after consultation with a Chairman of Committee only, the Committee itself not having been formally consulted in the matter, such action shall be reported to the Committee.

35. When a paper has been accepted for consideration, and appointed to be read, the author shall be informed of the meeting at which it is appointed to be read, and shall be supplied with a copy of Standing Order 2. In cases where the President or Secretaries, after consultation (if they see fit) with the appropriate Sectional Committee or its Chairman, are of opinion that at the meeting the author of the paper should be invited to make an oral statement, or that the abstract (or short paper) prepared for publication in the 'Proceedings' should be read, the author shall be informed of the fact, and be invited to be present.

36. Abstracts of papers, or short papers in full, which have been marked as suitable for publication in the 'Proceedings,' shall be set up in type without delay, and proofs submitted to authors for correction.

37. The 'Proceedings' of the Royal Society shall be published in numbers which shall be issued at as short intervals as may be found suitable, and shall contain:—

i. In reference to each meeting, a record of the formal business conducted at the meeting, the titles of the papers read at the meeting, and such an account of other communications made at the meeting or of other proceedings, not of the nature of business or of discussions on the papers read, as the President and Officers may judge it desirable to insert.

ii. Such abstracts of papers or such short papers ordered for publication in the 'Proceedings,' as may be ready to be published.

iii. Such papers, not of the nature of short papers, or such other matter as the Council may, in special cases, order to be published in the 'Proceedings.'

38. The Secretaries shall take what means they may think proper to secure that the account given in the 'Proceedings' of any communication made at a meeting besides the papers read, or of anything which occurred and seemed worthy of being recorded, shall be accurate; and if, from anything which takes place at a meeting, they should have reason to think that the Sectional Committee might wish, in respect to any paper, to reconsider the recommendation that it should be published, they shall have power to postpone the publication of that abstract or paper, and refer the abstract or paper once more to the Sectional Committee.

39. The account given in the 'Proceedings' of a "Meeting for Discussion" shall contain the communication made for the purpose of

opening the discussion (Standing Order 7), as well as such contributions to the discussion received in writing previous to meeting (Standing Order 9) as the respective authors may desire to see so published, provided always that all such communications are subject to the General Standing Orders relating to the publication of papers in the 'Proceedings.' There shall be no report of the discussion itself.

As to the 'Philosophical Transactions.'

40. Every paper communicated to the Society, and accepted for consideration, shall be referred by the Secretaries to the appropriate Sectional Committee through the Chairman of that Committee, provided always that, for the better expedition of the business of the Society, the Secretaries, as provided above (Standing Orders 33 and 36), shall have power, in the case of short papers, to proceed with the reading and publication of a paper previous to its having been considered by a Committee. If the said Chairman is of opinion that the subject of the paper does not lie within the scope of his Committee, he shall report the same to the Secretaries, who shall refer the paper to some other Sectional Committee. Should the Secretaries be of opinion that a paper pertains by its subject to more than one Sectional Committee, they shall take steps in order that the judgment of the several Committees concerned may be obtained. In the case of any difficulty as to the reference of a paper to its appropriate Sectional Committee or Committees, the Secretaries shall bring the matter before the Council.

41. The Chairman through whom the paper is referred shall bring the paper under the consideration of his Committee at the next regular meeting of the Committee, or at some earlier meeting which he may think it desirable to call, having in the meanwhile, if he and one or other of the Secretaries judge it desirable, submitted the paper to one or more Members of the Committee, or Fellows of the Society not Members of the Committee, whose opinion or opinions he shall report to the Committee.

The Sectional Committee, for its guidance in judging a paper so brought before it, shall obtain from at least two persons—who are knowing and well skilled in the particular branch of Natural Knowledge to which the said paper relates, and who may or may not be Members of the Committee, but, unless there be special reasons to the contrary, must be Fellows of the Society—acting as referees, opinions in writing upon the following points, viz.:—

i. Whether the paper should or should not be published in the 'Philosophical Transactions';

ii. Whether, in the former case, it should be published in full or in part only, the part so to be published being indicated;

iii. Whether any modifications are necessary or desirable, and, if so, of what nature;

iv. Which illustrations (if any) accompanying the paper should be reproduced.

Having obtained and considered such written opinions, and having, if it see fit, consulted another Sectional Committee or others of the Sectional Committees, and having at a meeting (in accordance with Standing Orders 23, 24) decided upon the above points, it shall embody its decisions, together with any other recommendations which it may think fit to make in reference to the paper, in a Report to the Council, signed by the Chairman, to which Report shall be appended, for inspection by the Council, the written opinions of the Referees.

42. The Sectional Committee, in thus deciding upon a paper, shall be guided by the principle that such a paper only should be recommended for the 'Philosophical Transactions' as appears to mark a distinct step in the advancement of Natural Knowledge.

43. If the Council approves of the Report of the Sectional Committee, the Secretaries shall immediately take action with regard to the publication of the paper, in accordance with the Report. If the Council does not approve of the report of the Sectional Committee, it shall request the Sectional Committee to reconsider its recommendations, and shall not come to a decision until it has received the further report of the Sectional Committee. But, for the better expedition of the business of the Society, the Secretaries, in such cases as they judge fit, shall have power to take steps with regard to the publication of a paper in the 'Philosophical Transactions,' in accordance with the decision of a Sectional Committee, previous to that decision having been brought before the Council; and they shall also have power, in cases in which they and the Chairman of the appropriate Sectional Committee agree in thinking it desirable, to take such steps as they may think fit with regard to the publication of a paper in the 'Philosophical Transactions,' previous to a formal decision of the said Committee upon the paper having been taken.

44. In the case of the Chairman of a Sectional Committee being the author of a paper referred to that Committee, the Secretaries shall have power, in consultation with some member or members of the Committee, other than the Chairman, to take the same action as under the foregoing standing orders they are empowered to take in consultation with the Chairman.

45. Each paper ordered for publication in the 'Philosophical Transactions' by the Council shall be published separately in paper covers, the date at which it is issued being marked on the cover, and shall be sold separately.

46. The several papers shall also be issued bound in two series—

A, containing those papers which are of a mathematical or physical character, and B, containing those of a biological character—at intervals, so far as possible regular, and of not too great a length; no paper being kept back more than six months from the date of its publication as a separate paper.

47. In the case of communications received in the Christmas, the Easter, or the Midsummer recess, the Secretaries shall have power, with the approval of the Chairman or Chairmen of the appropriate Sectional Committee or Committees, to issue a number or numbers of the 'Proceedings' containing such communications, without waiting for their being read at a meeting of the Society.

48. When the Council or the Society has appointed a person, or two or more persons acting as Committee, to carry out a particular inquiry, and the person or Committee has presented a report giving an account of such inquiry, the Council, having consulted the appropriate Sectional Committee or Committees in the usual way as in the case of a paper presented, shall direct the report, if deemed worthy of publication, to be published either in the 'Proceedings,' as a separate number if this should seem convenient, or in the 'Transactions,' according as the one or the other may seem the more suitable for the purpose.

49. A Year-book of the Society shall be published annually, so soon after the Anniversary Meeting as shall be convenient.

IV.

Relating to the Committee of Papers.

50. The Minutes of the Council sitting as Committee of Papers shall be kept separately from the ordinary Minutes of Council.

51. At each meeting of the Committee, the Secretary shall lay before the Committee a statement of the papers under consideration, showing briefly in the case of each paper the action which has been taken in regard to it, and the recommendations which may have been made concerning it by a Sectional Committee, together with, in the case of a paper recommended for publication in the 'Philosophical Transactions,' an approximate estimate of the cost of publication. Such a statement, or so much of it as is possible, shall be printed and distributed to the Members of the Committee previous to the meeting.

52. At each Meeting of the Committee the written decisions of the Sectional Committees, and the reports of referees, which may have been made in respect to papers mentioned in the Statement, shall be laid upon the table.

53. The Committee may, if it see fit, adopt *en bloc* all the recommendations contained in a Statement, provided always that if any Member of the Committee, either personally or, if absent, by writing,

object to any particular recommendation or recommendations, such recommendation or recommendations shall be considered separately, the remainder being treated *en bloc*.

54. The decisions of the Committee on all questions before it shall be by the majority of those present and voting, the voting being open unless any member demand a ballot, in which case the voting shall be by ballot.

EXPLANATORY NOTES ON THE PROCEDURE RELATING TO THE READING AND PUBLICATION OF PAPERS.

1. No paper is received by the Society unless it be communicated by a Fellow. A Fellow, in communicating a paper, is required by Statute to ascertain that the paper is a fit and proper one to be communicated; he should satisfy himself not only that the paper is by its nature so fit, but also that it has not previously been published elsewhere.

A Fellow, in communicating a paper, should state whether he (or the author) desires that it should be published in the 'Proceedings' or in the 'Transactions.' In the former case, the Fellow communicating should see that the paper does not exceed in length about twelve pages of 'Proceedings,' and is not accompanied by elaborate illustrations; in the latter case, a short abstract of the main points of the communication must accompany the full paper. Since the MS. of a communication received and read, but not published by the Society, is retained in the possession of the Society,* an author is recommended not to send in the sole copy of his MS.; and it is advisable that the copy sent to the Society should be type-written, and, if possible, on a foolscap page.

It will be also convenient if, at the time of sending in the paper, the Assistant Secretary is informed what days of meeting will best suit the author for the reading, supposing it be decided that the paper should be read, and whether he wishes to be present, and whether he is prepared to illustrate the reading of the paper by experiments, projection slides, diagrams, &c. The Society cannot, however, undertake always to fix the reading of the paper on the day or even one of the days proposed by the author.

2. When a communication has been "received," the first decision taken with regard to it is whether it should be "accepted for consideration." (Standing Order 30.)

If it be not accepted for consideration, the Fellow communicating

* While retaining a MS. not ordered for publication, the Council are generally willing to return to the author drawings, &c., illustrating the paper.

the paper is informed of this, and he may, under certain conditions, withdraw the paper. (Standing Order 31.)

3. If it be accepted, the next decision relates to the reading of the paper.

According to the nature of the paper, and according to circumstances, the reading may consist of the title only being read by one of the Secretaries, or the paper may be read in whole or in part by one of the Secretaries, or the author may be invited to give an oral exposition of the contents of his paper, with such experimental or other illustrations as he may desire.

A decision having been come to as to the date of the reading, this will be communicated to the author, who, according to the decision taken, will be invited to be present, and may be requested to give an oral exposition.

4. When a paper has been judged suitable for publication in the 'Proceedings,' it is without delay set up in type, so that, if possible, printed copies may be in the hands of Fellows at the meeting at which the paper is read. A proof of the paper is sent to the author with the request that he will revise the proof as carefully as possible, and return it to the Assistant Secretary as soon as possible.

It may be found desirable to set up in type and even distribute at a meeting a paper which has been marked for reading, but about the publication of which no decision has as yet been come to. Hence, receipt of the proof must not be considered by the author as an indication that the paper will certainly be published.

5. If the author, in revising the proof thus sent to him, be led to make other than verbal or unimportant corrections, or to make additions, he must, in view of the publication of the paper, carefully date all such important corrections or additions. Any such corrections or additions introduced into any subsequent revise of the paper must be similarly dated.

A paper, when published, bears on it the date of reception of the MS.; this may be used in claims of priority, and the rule just given about dating corrections and additions is intended to prevent the author claiming the date of the reception of the MS. for important statements introduced into the paper after that date.

6. An author can, if time permits, receive, on application to the Assistant Secretary, any reasonable number of copies of the proof of his paper, corrected so far as is possible, in order that if he so wishes he may send, before the meeting at which the paper is read, copies of the proof to persons likely to take part in any discussion which may follow the reading of the paper. The Society leaves to the individual author the responsibility of thus making known the results of his labours before the account of those results is formally read; so far

as the Society itself is concerned, a paper communicated to it is regarded as private until it has been read.

7. When a paper has been ordered for publication in the 'Proceedings' and read, it is desirable to avoid everything which would delay its publication. Hence an author should correct the first proof of his paper so carefully that he does not need to see a second proof or revise. It will frequently, however, be found desirable for the author to see such a revise after the paper has been read. It is most important that the corrections then made should be final, and should be made without delay. A demand for still another revise, or any delay in returning that revise, is nearly sure to prevent the paper appearing in the particular number of the 'Proceedings' which gives an account of the meeting at which the paper was read.

8. Editors of periodicals are often anxious to obtain copies of the papers read before the Society, in order that they may publish them, in whole or in part, in their own periodicals, without waiting for the appearance of the papers in the 'Proceedings' of the Society. The Society offers no objection to this practice, provided that the copy sent to the periodical is identical with the paper as it will appear in the 'Proceedings.' For this reason the Society keeps the distribution of such copies in its own hands, and does not entrust it to the authors. Otherwise, the Society would have no guarantee against the following accidents, which, indeed, previous to the present arrangements having been made, did actually occur. If it were left to the author, he might send to a periodical an early proof of a paper which, before it was ordered for publication, needed large amendment, so that the paper, as it appeared in the said periodical, might differ widely from the paper as it appeared in the 'Proceedings.' Again, since a paper ordered for reading is, for the convenience of Fellows attending the meeting at which the paper is read, usually set up in type without delay, and may be, indeed often is, so set up before it has been decided to publish the paper, it might happen (and, indeed, has happened) that an author sent to a periodical a copy of a paper as if it were about to appear in the 'Proceedings,' and yet that paper never so appeared. To avoid such undesirable occurrences, the following practice has been adopted. With the proofs of his paper the author receives a form to fill up, stating to what periodicals he wishes separate copies of his paper, *so soon as it is finally passed for press*, to be sent, and the Society distributes the copies according to the list returned. The form sent to the author contains the titles of several periodicals to which separate copies will be sent on his returning the form with his signature attached. The author can modify the list as he wishes, striking out from or adding to it.

9. When a paper is printed off for the 'Proceedings' the author

is entitled to receive gratis 100 separate copies; he can have 150 additional separate copies at cost price.

10. One object of the regulations just described is to enable the Secretaries to publish as quickly as possible the papers (including abstracts) ordered for publication in the 'Proceedings,' and, save in special cases, the deliberations necessary for ordering these to be published do not take a long time.

Any decision as to publishing a paper in the 'Philosophical Transactions' necessarily takes a longer time, since the responsibility of this rests with the Sectional Committee or Committees and the Council, no such freedom of action being given to the Secretaries and Chairmen of Committees as is given in the case of papers published in the 'Proceedings.' The author, however, may greatly help to shorten the interval between the reception of a paper and its publication in the 'Philosophical Transactions' by attending to the following matters:—

(1) The MS. should be, if possible, type-written, or at least written in a legible hand, and *properly prepared as copy for press*, so that the subsequent corrections in spelling, grammar, construction of sentences, references, &c., may be as few as possible.

(2) When the paper is accompanied by illustrations, these should be sent in *ready for reproduction*. Figures, for instance, for which a "process" can be used, should be supplied in a condition in which the process may be directly applied; figures intended to be lithographed should be properly arranged as Plates of the proper size, and so on.

(3) When the author is requested to make changes or additions to his paper before it is published, these should be made without delay; the tardy appearance of papers in the 'Philosophical Transactions' has often been due to delay of this kind on the part of the author.

PROCEDURE IN THE NOMINATION OF THE COUNCIL.*

1. The subject of the new Council shall be taken into consideration at a Meeting of Council to be held on the last Thursday of October; and with the summons for that Meeting there shall be transmitted a list of the Members of the existing Council, with the number of their attendances at Meetings up to that date; also a List of the Fellows of the Society, with an indication of those who have at any time served on the Council, and the dates of their service.

2. At this Meeting the names of those Members of the existing Council who retire at the ensuing Anniversary shall be determined,

* From Minutes of Council, June 20, 1872.

Thereafter each Member present shall hand to one of the Secretaries a List of not exceeding ten Fellows whom he proposes for the new Council, of whom five shall not have already served on the Council. Members not able to be present may send in similar lists previous to the Meeting. The several lists of names so proposed shall then be read out by the Secretary.

3. Before the next following Meeting, the President and Officers shall prepare a list of twenty-one names for consideration by the Council, which list shall include ten names selected from those proposed at the previous Meeting, or other names, if required to make up that number. The list so prepared, together with a statement of the names proposed, and the number of votes given for each, shall be sent out confidentially with the summons for the ensuing Meeting, at which Meeting the names to be finally recommended shall be balloted for. In taking the ballot, a copy of the list, prepared by the Officers, shall, with such alterations as he may see fit to make therein, be delivered by each Member of the Council present and voting, and the names found to have the majority of votes shall form the list to be recommended to the Society.

4. The President and Council shall then nominate by ballot, out of the proposed Council, the persons whom they recommend to the Society for election to the offices of President, Treasurer, Principal Secretaries, and Foreign Secretary, for the ensuing year.

PROCEDURE OF THE COUNCIL IN THE NOMINATION OF FOREIGN MEMBERS.

(*Statutes, Cap. I, §§ XIX—XXI.*)

XIX. "A book shall be kept in which Members of the Council may enter the names of those men of science whom they suggest as Foreign Members; each entry shall be signed by the proposer, and be accompanied by a short statement of the principal grounds on which the suggestion is made, and shall be valid for three years only.

XX. "When vacancies are to be filled up, a list of the persons so entered shall be sent to each member of the Council, together with notice of the Meeting at which the list will be considered. At the Meeting thus appointed further entries may be made, and the claims of those men of science whose names have been duly entered in the book shall be considered, and a selection of names shall be

made, from among which the Council, at a subsequent Meeting to be then appointed, may make nominations to the Society.

XXI. "At the second Meeting the selection of the Candidates to be nominated shall be by ballot; when, if two-thirds of the Members of the Council present be in favour of the nomination of any Candidate, he shall be proposed at the next Ordinary Meeting of the Society, and shall be put to the vote at the following Ordinary Meeting."

PROCEDURE OF THE COUNCIL IN THE ADJUDICATION OF THE MEDALS.

1. At the first Meeting on the subject of the Medals, the Members of Council are invited to *suggest* a name, or names, which they may deem worthy of consideration in the adjudication of each of the several Medals. The list of suggested names then formed to be entered on the Minutes, with power to Members of Council to add to it afterwards, if they see fit.

2. At a subsequent Meeting (or Meetings), to be held before the Midsummer Recess (at which additions may be made to the List of suggestions), every Member of the Council present is at liberty to *propose* for each Medal the name of a person whom he recommends to be selected to receive it, specifying the particular work or works which form the ground of his recommendation; and these proposals, being seconded, shall be entered on the Minutes. At the same time the proposer is expected to deposit with one of the Secretaries a detailed statement of the claims of the person recommended by him, for consultation by Members of the Council, should they so desire.

3. The Council to be summoned on the last Thursday of October, for the purpose of discussing the merits, as regards the award of the Medals of the persons severally proposed. Additional proposals may be made at this Meeting, if assented to by two-thirds of the Members present.

4. The Council to meet for further consideration of the proposals on the first Thursday in November; the awards to be decided either on that day or at an early adjourned Meeting.

CONDITIONS OF AWARD OF THE ROYAL SOCIETY'S MEDALS.

The Copley Medal

is awarded to the living author of such philosophical research, either published or communicated to the Society, as may appear to the Council to be deserving of that honour. The subject or subjects of research, on account of which the medal is awarded, must be specified in making the award.

No limitation is imposed either as to the period of time within which that research was made, or to the particular country to which its author may belong.

The medal may not be awarded to any person who is a Member of the Council at the time when the award is made.

The medal may be given more than once to the same person if the Council deem it expedient.

The medal is, as far as circumstances admit, awarded annually.

The Rumford Medal,

consisting of a gold medal with a silver copy struck in the same die, is awarded once every second year "to the author of the most important discovery or useful improvement which shall be made and published by printing or in any way made known to the public in any part of Europe during the preceding two years on Heat or on Light, the preference always being given to such discoveries as, in the opinion of the President and Council of the Royal Society, tend most to promote the good of mankind.

"If during any term of years from the last award no new discovery or improvement shall have been made in any part of Europe relative to Light or Heat, in the opinion of the President and Council of sufficient importance to deserve the award, it may not be given, but the value of it may be reserved, and being laid out in the purchase of additional stock may augment the capital; and the interest of the same, by which the capital may from time to time be so augmented, may be given in money" at a subsequent award with the two medals.

The Royal Medals,

consisting each of a gold medal with a silver copy struck in the same die, are awarded annually by the Sovereign upon the recommendation of the Council, for the two most important contributions to the advancement of Natural Knowledge, published origiually in Her Majesty's dominions within a period of not more than ten years, and of not less than one year of the date of the award.

In the award of the Royal Medals one is given in each year to each of the two great divisions of Natural Knowledge.

THE DAVY MEDAL

is awarded annually for the most important discovery in Chemistry made in Europe or Anglo-America.

THE DARWIN MEDAL,

which is accompanied by a grant of £100, is given biennially in reward of work of acknowledged distinction (especially in Biology) in the field in which Mr. Darwin himself laboured. The award may be made either to a British subject or a foreigner, and without distinction of sex.

THE BUCHANAN MEDAL,

which is accompanied by a grant of the balance of the Buchanan Medal Fund which may have accumulated since the last award, is awarded every five years in respect of distinguished services to Hygienic Science or Practice in the direction either of original research or of professional, administrative, or constructive work, without limit of nationality or sex.

THE SYLVESTER MEDAL,

which is accompanied by a grant of the balance of the income of the Sylvester Medal Fund, is awarded triennially for the encouragement of Mathematical Research, irrespective of nationality.

HUGHES MEDAL.

Under the will of the late Professor E. E. Hughes, the Society has received a bequest, which will be applied to the award of a medal on the following conditions:—

1. A Gold Medal, to be called "The Hughes Medal," bearing a bust of the donor, and not exceeding in value the sum of £20, shall be awarded annually, together with the balance of the income of the Fund, to such person as the President and Council may consider the most worthy recipient, without restriction of sex or nationality, as the reward of original discovery in the Physical Sciences, particularly electricity and magnetism or their applications, such discovery or applications having been published not less than one year before the award.

2. If in any year the Council do not see fit to award the medal, owing to no one being deemed sufficiently worthy of it, the income for that year shall be invested and added to the principal of the Fund.

THE MACKINNON RESEARCH STUDENTSHIP.

Under the will of the late Sir William Mackinnon the Society has received a bequest to be applied to the foundation and endowment of

prizes or scholarships for the purpose of "furthering Natural and Physical Science, including Geology and Astronomy, and of furthering original research and investigation in Pathology," and the following regulations have been drawn up for the administration of the Trust:—

(1) A Studentship of the present annual value of £150 shall be offered, under the name of "The Mackinnon Research Studentship."

(2) The award shall be made by the Council on the recommendation of a Committee to be appointed by the Council.

(3) The Studentship shall in every case be awarded for one year, but shall be renewable for a second year on the recommendation of the Committee after consideration of a report from the student upon his first year's work.

(4) The Studentship shall be awarded, so far as possible, alternately, for investigations in the two main divisions of Science corresponding to the two series (A and B) of the 'Philosophical Transactions,' but not including Mathematics.

(5) Applications for the Studentship shall be invited by some mode of public announcement, to be hereafter determined, the terms of the announcement making reference to the conditions of the Bequest, the division of Science in which the last awarded Studentship has been held, and to the fact that preference will be given to a student of the alternate division.

(6) Candidates shall be required to state whether they hold other endowments, and the Committee shall have power to make inquiry into and take into account the other resources of the candidates.

(7) The research for which the Studentship is awarded shall be carried out only at a place approved by the Council, but the student shall not be allowed to carry on other work without the approval of the Council.

(8) The award shall be made always before the end of the Summer term, and the first award shall be made in the Summer of 1901.

(9) In the event of a Studentship not being awarded, or from any cause lapsing before the expiry of the term for which it is granted, the unexpended income of the fund shall be invested so as to be available for extraordinary expenditure in furtherance of the general objects of the Bequest.

REGULATIONS FOR ADMINISTERING THE GUNNING FUND.

A statement of the foundation will be found in the Account of the Society's Trusts, in the 'Record.' The regulations for its administration, proposed by the Council, March 14, 1895, and adopted by the Founder, May 16, 1895, are here subjoined.

REGULATIONS.

1. That the Fund should not be applied in the form of a prize, medal, or reward, but should be devoted to the furtherance of knowledge in some special direction.

2. That, by preference, the interest accruing from the Fund during every three years be applied for the promotion of Physical Science and of Biology alternately.

3. That aid should, by preference, thus be given in Physical Science and Biology respectively, either to investigations or operations which require to be repeated from time to time, or to the development of some specified continued line of research.

In illustration of Regulation 3, the Council suggested as follows:—"Among subjects that would thus seem fitting for the application of the Fund, the following might be given as instances:—The renewal from time to time of magnetic observations in the British Isles; the compilation and publication, at intervals, of detailed lists of well-authenticated spectra; systematic determination of biological data in special regions or under special conditions; assistance to naturalists or others carrying on explorations or special investigations in foreign countries; continued bacteriological observations, similar to those carried out under the direction of the Water Research Committee and others."

REGULATIONS FOR ADMINISTERING THE JOULE FUND.

(*Council Minutes, March* 14, 1893.)

1. That the proceeds be applied in the form of a Studentship or Grant, to be awarded every other year, to assist Research, especially among younger men, in those branches of Physical Science more immediately connected with Joule's work.

2. That this Grant be International in its character, and awarded alternately in Great Britain and abroad, or in such order as the President and Council shall from time to time decide.

3. That it be awarded in Great Britain by the President and

Council of the Royal Society; and, for award in France, offered to the "Académie des Sciences," Paris; and in Germany, to the "K. Akademie der Wissenschaften," Berlin; or, in any other country, to the leading scientific institution, for award in that country.

4. That the award in Great Britain be made on the recommendation of a Committee, from time to time appointed by the President and Council of the Royal Society, but not of necessity confined to Fellows of the Society.

PUBLICATION FUND REGULATIONS.

(*Council Minutes, June* 15, 1899.)

The following scheme of regulations for the administration of the Publication Grant from H.M. Treasury, has been adopted by the Council:—

Regulations for the Administration of the Government Publication Grant.

I. The allotment of the Grant shall be made by the President and Council.

II. In allotting the Grant, the President and Council shall "assist not merely their own publications, but also the adequate publication of scientific matter through other channels and in other ways."

III. In making allotments for the purpose of assisting the adequate publication of scientific matter other than the Society's own publications—

1. The President and Council shall consider—
   (i.) Proposals made by Members of the Council.
   (ii.) Applications made by other Scientific Societies through the usual official channels.
2. Original memoirs shall be considered as having a first claim on the Grant, the aid being given towards the expense either of illustrations or of press-work; but the President and Council shall have power, if they see fit, to make an allotment in aid of other publications which tend to the advancement of natural knowledge, such as reports, abstracts, &c.
3. No decision of the President and Council at any one meeting of the Council, to allot a portion of the Grant, shall be valid unless it receives the support of three-fourths of the members present and voting; but the decision of a simple majority at any one meeting shall be made valid if confirmed by a majority at a subsequent meeting.

IV. The balance of the Grant remaining over at the close of the financial year, after deducting the amounts allotted under Section III, shall be placed to the credit of the General Fund of the Society, to assist in the production of the Society's own publications, unless the President and Council shall otherwise order.

REGULATIONS FOR ADMINISTERING THE SCIENTIFIC RELIEF FUND.*

The history of the Scientific Relief Fund will be found in the account of the Society's Trusts contained in the "Record." The following are the Regulations at present in force:—

Regulations.

1. There shall be a fund called The Scientific Relief Fund, and the object of it shall be to aid such scientific men, or their families, as may from time to time require assistance.
2. All contributions to the fund shall be invested in the name of the Royal Society in such funds as are authorised for investment by Trustees; and in such manner as to form a separate account from that of the Society's other funded property.
3. The fund shall be administered by a Committee, called The Scientific Relief Committee, which shall consist of ten Fellows of the Royal Society, and it shall be the duty of such Committee to select the recipients on whose behalf the income derived from the fund may be properly applied—always reporting thereon to the Council for confirmation.
4. The capital of the Fund shall remain entire, and the interest only shall be at the disposal of the Committee.
5. If the whole of the interest shall not be expended in one year, the surplus shall be carried to the next year's account; and, if at any time any surplus in excess of the ordinary income of the year last past shall thus accrue, the Council shall cause the whole, or part of it, to be added to the capital sum already invested; or, should they think fit, may cause any accumulated interest to be invested as unexpended income, the securities purchased being liable from time to time to be realised, and the proceeds expended as income.

* Mainly codified from the Original Regulations adopted by the Council Nov. 3, 1859 (see also Minutes of May 26, 1859), and subsequent modifications passed by the Council on Dec. 22, 1859, Jan. 18, 1866, April 30, 1891, Jan. 19, 1893, April 30, 1896, Nov. 5, 1896.

6. No application for relief shall be entertained except on the recommendation of the President of one of the following Scientific Societies:—The Chemical, Entomological, Geological, Linnean, London Mathematical, Physical, Royal, Royal Astronomical, Royal Geographical, Royal Meteorological, Royal Irish Academy, Royal Society of Edinburgh, Society of Antiquaries, or Zoological Society; it being understood that the several Presidents will consult their respective Councils as to the persons whom they intend to recommend for relief.
7. The members of the Committee shall be appointed by the Council, and shall consist of ten members, each of whom shall serve for five years, so that two retire annually, and be not eligible for re-appointment on the occasion of their retiring. Should a vacancy occur by reason of death or otherwise, at any intermediate time, the Council shall appoint a person to fill the vacancy, and the person so appointed shall retire at the time the member whose place he fills would have retired had he continued until then to be a member, but if he have not served more than two years shall be eligible for re-appointment.
8. The Council shall annually appoint a member of the Committee to act as Chairman for the ensuing year. The Chairman shall have power to nominate one of the Committee to act as his deputy.
9. The Chairman, or his deputy, shall have power to summon a meeting of the Committee at his discretion, and shall fix the time of such meeting.
10. Three of the Committee shall form a quorum.
11. The Treasurer of the Society shall have power, on the requisition of the Chairman of the Committee, or of his deputy, made in pursuance of a resolution of the Committee, but subject, nevertheless, to the provisions of Regulation 12, to make payments out of the Scientific Relief Fund not exceeding £100 in any one case, reporting such action to the Council at its next meeting.
12. The Chairman, or his deputy, shall, notwithstanding Regulation 6, have power to act in urgent cases during vacations of the Society, after consultation with one of the Secretaries of the Society, without calling the Committee together. In such cases the Chairman shall, after the vacation, summon a meeting of the Committee and report his action.

In the first Report of the Committee, dated November 30, 1864, it is stated that "It formed no part of the scheme to attempt the grant of annuities; it was rather intended to afford *prompt* relief of the immediate wants of those upon whom sudden affliction had fallen;

although at the same time, it in no way debarred a continuation of such relief being given should the funds admit thereof." This intention of the founders, although it has not been embodied in a Regulation, has been continued, as a policy, to the present time.

Applicants are desired to fill in a form which can be obtained from the Assistant Secretary of the Royal Society, in which (confidential) information is requested upon the following points:—

1. Name, Age, and Social Condition.
2. Nature of Claims, stating scientific work done by the subject of the proposed grant, or by the member of his family on whose scientific claim he relies, appending a list of his principal contributions to science.
3. The nature of the emergency, and how it has arisen.
4. Whether the applicant is receiving, or has received, during the past six months, pecuniary aid from any other source.
5. Whether the applicant is entitled or able, in the circumstances which have arisen, to look to any other assistance; and, if so, what is the source and extent of such expected assistance.
6. Particulars of—

    Number in family.
    How many are self-supporting.
    How many are partially dependent.
    How many are wholly dependent.

In 1886 Sir William (now Lord) Armstrong gave a sum of £7,800 to the Scientific Relief Fund, on the understanding that the said fund should be used for remission of fees in cases of urgent necessity. By a Resolution of Council passed December 10, 1889, "the question of the remission of fees to Fellows of the Society in impecunious circumstances is reserved for the sole consideration of the President and Council of the Society, the amount thus from time to time bestowed being communicated to the Scientific Relief Committee."

NATIONAL PHYSICAL LABORATORY.

Her Majesty's Government having agreed to ask Parliament for a grant not exceeding £12,000 for the buildings and equipment of a National Physical Laboratory, and for an annual sum of £4,000 for five years certain as a grant in aid of the expenses of conducting the Institution, the appended scheme for the organization and management of the Laboratory has been drawn up by the Royal Society and approved by Her Majesty's Government.

Scheme of Organization.

1. The name of the Institution shall be the National Physical Laboratory. The Kew Observatory shall be incorporated therewith.

2. The ultimate control of the Institution shall be vested in the President and Council of the Royal Society, who in the exercise thereof may from time to time issue such directions as they may think fit to the General Board and Executive Committee hereinafter described. The President of the Royal Society shall be the Chairman of the Governing Body as hereinafter defined. The income and all other property of the Institution shall be vested in the Royal Society for the purposes of the Institution.

3. For the present, and until otherwise ordered by the President and Council of the Royal Society, with the approval of H.M. Treasury, there shall be a Governing Body for the Institution, consisting of a General Board and an Executive Committee, the constitution and duties of which shall be as hereinafter defined. Provided always that the Permanent Secretary of H.M. Board of Trade shall be *ex officio* a member of the Governing Body, and that the choice of members of the Governing Body, or of any Committee thereof, shall not be confined to Fellows of the Royal Society.

4. The General Board shall consist of the President, Treasurer, and Secretaries of the Royal Society, the Vice-Chairman of the Board (appointed as defined below by the President and Council of the Royal Society), the Permanent Secretary of the Board of Trade, and of thirty-six ordinary members.

Twenty-four of the ordinary members shall be appointed by the President and Council of the Royal Society; of the remaining twelve ordinary members, two shall be nominated for appointment by the Council of each of the following Institutions, as being fitted to represent commercial interests in connection with the Laboratory:—

The Institution of Civil Engineers.
The Institution of Mechanical Engineers.
The Institution of Electrical Engineers.
The Iron and Steel Institute.
The Institution of Naval Architects.
The Society of Chemical Industry.

In the selection of ordinary members of the General Board care shall be taken that Scotland and Ireland are represented.

Any person not being already a member of the General Board who shall become a member of the Executive Committee, shall be a

member of that Board during his tenure of office on the Executive Committee, but shall be regarded as an additional, and not as an ordinary, member of the Board.

5. The Executive Committee shall consist of the President, Treasurer, and one of the Secretaries of the Royal Society; the Vice-Chairman of the Executive Committee (appointed as defined below); the Permanent Secretary of the Board of Trade; six persons appointed by the President and Council of the Royal Society from among those who are members of the Kew Observatory Committee at the time when the Kew Observatory is incorporated in the National Physical Laboratory (two of these six persons shall retire at the end of every two years, and vacancies occurring amongst them by retirement or otherwise shall not be filled up); and of twelve ordinary members.

The ordinary members shall be nominated by the President and Council of the Royal Society, but one-half shall be chosen from among those members of the General Board who have been nominated as fitted to represent commercial interests on that Board.

Those members of the Executive Committee who are Fellows of the Royal Society, shall be appointed by the President and Council to be the Gassiot Committee of the Royal Society.

6. The Vice-Chairman of the General Board shall be appointed by the President and Council of the Royal Society, and shall also be Vice-Chairman of the Executive Committee. He shall hold office for six years, and shall be eligible for re-appointment, but shall not hold office for more than twelve years.

7. At least one-sixth of the ordinary members of the General Board and of the Executive Committee shall retire annually.

In the case of the General Board, the retiring ordinary members shall be those who have not attended a meeting of the Board for two years, together with so many other members of the Board, selected by seniority, as may be necessary to bring the number of retiring members up to one-sixth of the whole number of ordinary members of the Board.

In the case of the Executive Committee, the retiring ordinary members shall be those who have not attended one-half of the meetings of the Committee during the previous year, together with so many other members of the Board, selected by seniority, as may be necessary to bring the number of retiring members up to one-sixth of the whole number of ordinary members of the Board.

No retiring member of the General Board or of the Executive Committee shall be eligible for re-appointment until at least one year has elapsed from the date of his retirement.

The President and Council shall have power to remove from the

General Board and from the Executive Committee any member of either whom they may judge to be disqualified.

Vacancies on the General Board or on the Executive Committee due to death, resignation, or removal by the President and Council of the Royal Society, shall be filled by the President and Council of the Royal Society, provided always that—

(1) Any person so appointed shall, for the purposes of the regulations for retirement from the Board or Committee, be regarded at the time of his appointment as having served for the same period as the member to whose place he succeeds.

(2) If the vacancy on the General Board be caused by one of the persons nominated as fitted to represent commercial interests ceasing to be a member of the Board, the President and Council of the Royal Society shall choose his successor from among a list of names recommended by the Councils of the Institutions named in Section 4.

(3) If a vacancy on the Executive Committee be caused by one of the persons nominated as fitted to represent commercial interests ceasing to be a member of the Committee, his successor shall either be selected from among those members of the General Board who were nominated as fitted to represent commercial interests, or shall be nominated by the President and Council of the Royal Society after consultation with the Councils of the Institutions named in Section 4.

The President and Council of the Royal Society shall determine the order of the seniority of the members of the first General Board and of the first Executive Committee for the purposes of the regulations for retirement.

The Executive Committee.

8. The Executive Committee shall have the immediate management of the National Physical Laboratory; shall appoint and dismiss the officials, except the Director; and shall determine the nature of the work to be undertaken from time to time.

The General Board.

9. A meeting of the General Board shall be held in October, at which the Executive Committee shall present a report on the work and finances of the National Physical Laboratory during the year ending on the preceding September 30. Copies of this report shall be circulated among the members of the General Board at least one week before the meeting, and after the meeting shall be forwarded to the President and Council of the Royal Society, together with any

further report, resolutions, or recommendations which may be added by the General Board.

The Executive Committee shall also lay before the General Board at its meeting in October a statement as to the work which it is proposed to undertake in the Laboratory during the ensuing year. This statement shall be circulated among members of the Board at least a week before the meeting; and the General Board may make such recommendations relative to the statement, or to the future work of the National Physical Laboratory, as they may think fit.

These recommendations shall be laid before the Executive Committee for their consideration.

Sub-Committees.

10. The Executive Committee may from time to time appoint Sub-Committees, of which the members shall not necessarily be members of the Executive Committee or of the General Board, either to superintend or to assist in certain specified investigations, or to superintend some department of the National Physical Laboratory.

The Director.

11. The Director of the National Physical Laboratory shall be appointed by the President and Council of the Royal Society after consultation with the Executive Committee, on such terms as the President and Council may determine, and shall be removable by the President and Council. He shall be responsible to, and shall take instructions from, the Executive Committee, but, subject to such instructions, he shall have the sole direction and control of the officials of the National Physical Laboratory and of the work done within it.

The Executive Committee may delegate its power of appointing and dismissing the officials of the Institution to the Director in such cases as it may think fit.

The Director shall neither be allowed nor be called upon to undertake work not connected with the National Physical Laboratory, except with the consent of the Executive Committee.

Finance.

The Royal Society shall open a banking account, to be called "The National Physical Laboratory Account of the Royal Society," into which all sums received by the Executive Committee for the purposes of the Institution shall be paid. The Treasurer of the Royal Society shall also pay into this account all sums received by him for the said purposes, after deducting therefrom such amounts as he shall be

directed by the President and Council, with the approval of the Treasury, to retain for the purpose of defraying any expenses which the Royal Society may incur in the exercise of its control of the Institution.

The Executive Committee shall be empowered to draw on this account for the purposes of the Institution by cheques signed by such members of the Executive Committee as may be authorised by the Committee to do so.

Legal Proceedings.

Any legal proceedings with regard to the affairs of the Institution, which it may become necessary to institute or defend, shall be instituted or defended by the Solicitors of the Royal Society, in the name and on behalf of the Royal Society upon the instructions of the Executive Committee, but no such proceedings shall be instituted or defended without the order of the President and Council of the Royal Society.

The Kew Observatory Committee of the Royal Society.

"The Kew Observatory Committee of the Royal Society," incorporated under the Companies Act, 1867, shall be wound up; and the property thereof shall be held by the Royal Society for the purposes of the Institution.

GENERAL BOARD OF THE NATIONAL PHYSICAL LABORATORY.

The President of the Royal Society
The Vice-Chairman of the Board (Lord Rayleigh)
The Treasurer of the Royal Society
The Secretaries of the Royal Society
The Permanent Secretary of the Board of Trade
} *Ex officio.*

Sir W. H. Preece, K.C.B., F.R.S.
Sir J. Wolfe-Barry, K.C.B., F.R.S.
} Nominated by the Inst. Civil Engineers.

Sir William White, K.C.B., F.R.S.
Sir Edward Carbutt, Bart.
} Nominated by the Inst. Mechanical Engineers.

Mr. Alexander Siemens
Professor W. E. Ayrton, F.R.S.
} Nominated by the Inst. Electrical Engineers.

Mr. George Beilby
Mr. Walter F. Reid
} Nominated by the Society of Chemical Industry.

Sir Wm. Roberts-Austen, K.C.B., F.R.S.
Sir F. Abel, Bart., K.C.B., F.R.S.
} Nominated by the Iron and Steel Institute.

Sir Nathaniel Barnaby, K.C.B.
Mr. J. T. Milton
} Nominated by the Institute of Naval Architects.

Sir W. de W. Abney, R.E., K.C.B., F.R.S. Professor W. G. Adams, F.R.S. Capt. E. W. Creak, R.N., F.R.S. Professor Carey Foster, F.R.S. Mr. Francis Galton, F.R.S. Professor J. Perry, F.R.S. The Earl of Rosse, F.R.S. Dr. R. H. Scott, F.R.S. Mr. W. N. Shaw, F.R.S. Sir R. Strachey, G.C.S.I., F.R.S. Sir Wm. Wharton, K.C.B., F.R.S.	Members of the Kew Observatory Committee.
Professor R. B. Clifton, F.R.S. Professor O. Lodge, F.R.S. Sir A. Noble, K.C.B., F.R.S. Professor A. Schuster, F.R.S. Professor J. J. Thomson, F.R.S. Dr. T. E. Thorpe, For. Sec. R.S.	Members of the Executive Committee appointed by the President and Council of the Royal Society.
Lord Kelvin, F.R.S. Dr. Buchan, F.R.S. Mr. R. Crompton Professor Fitzgerald, F.R.S. Professor J. Joly, F.R.S. Mr. C. E. Stromeyer Mr. Hugh Bell	Nominated by the President and Council of the Royal Society.

EXECUTIVE COMMITTEE OF THE NATIONAL PHYSICAL LABORATORY.

The President of the Royal Society The Vice-Chairman of the General Board of the Laboratory The Treasurer of the Royal Society A Secretary of the Royal Society (Professor A. W. Rücker) The Permanent Secretary of the Board of Trade	*Ex officio.*

VICE-CHAIRMAN OF THE COMMITTEE.

Lord Rayleigh, F.R.S.

OTHER MEMBERS OF THE EXECUTIVE COMMITTEE.

Sir W. de W. Abney, F.R.S. Capt. Creak, F.R.S. Professor Carey Foster, F.R.S. Mr. F. Galton, F.R.S. Professor Perry, F.R.S. Gen. Sir R. Strachey, F.R.S.	From among the Members of the Kew Observatory Committee.

Sir John Wolfe-Barry, F.R.S. Sir Edward Carbutt Mr. A. Siemens Sir William Roberts-Austen, F.R.S. Mr. G. Beilby Sir Nathaniel Barnaby	From among those Members of the General Board nominated by the technical Societies named in the Scheme.
Professor Clifton, F.R.S. Professor O. Lodge, F.R.S. Sir Andrew Noble, F.R.S. Professor A. Schuster, F.R.S. Professor J. J. Thomson, F.R.S. Dr. Thorpe, For Sec. R.S.	Nominated by the President and Council of the Royal Society.

October, 1899.

REPORT OF THE EXECUTIVE COMMITTEE FOR THE YEAR, OCTOBER 1, 1899, TO SEPTEMBER 30, 1900.

In presenting their Report to the General Board of the Laboratory the Executive Committee have to express their regret that, in consequence of the delay in determining on the site, the progress made during the year has not been as great as they had hoped for.

The following, however, is a brief record of the main events:—

After a conference with the Commissioners of Woods and Forests, some members of the Executive Committee visited various sites suggested by the Commissioners, and reported strongly in favour of the site originally suggested by the Treasury Committee, in the Old Deer Park at Richmond.

Further interviews were held with the Commissioners, and, subject to the approval of the Treasury, terms were arranged by which an area of about 15 acres was provisionally secured to the Committee for the purposes of the Laboratory.

The terms of the agreement were laid before the General Board at a meeting, on February 9, 1900, and a resolution was passed approving them.

Meanwhile it had been agreed to approach the Office of Works, with a view to having the building constructed by them, and a Building Committee was appointed to prepare plans.

In the early part of the year the Director visited the Reichs-Anstalt in Berlin, and the Bureau International at Sévres, in order to make himself acquainted with the arrangement of these two institutions before the plans were drawn up. The Committee are glad to have this opportunity of recognising the courtesy with which he was received by the authorities of these two institutions.

During the autumn of 1899 various sub-committees had reported on the work which might be usefully undertaken by the Laboratory, and the Building Committee were instructed to have regard to these reports in the preparation of the plans.

From the consideration of these it appeared that it would be desirable to erect two buildings at some distance apart. In the one which it was proposed to call the Physics Laboratory, experiments requiring great stability and freedom from disturbance would be carried out; the other, which might conveniently be placed nearer a main road, would be an Engineering Laboratory.

Accordingly, plans for a Physics building, at an estimated cost of £6,000, and an Engineering Laboratory, at an estimated cost of £4,000, were approved by the Executive Committee. These were submitted to the General Board at their meeting on June 25, 1900.

Meanwhile, questions had been asked in Parliament with regard to the site, and Mr. Hanbury received a deputation from persons opposed to placing the Laboratory in the Old Deer Park. This was followed by a deputation from the Royal Society, who urged that the scheme proposed by the Treasury Committee, and adopted in its general features by the Treasury in a letter to the President, dated October 7, 1898, should be carried out.

At their meeting held on October 24 the Executive Committee received a semi-official communication from the Treasury stating that the Government, with Her Majesty's approval, had determined to allot the Bushey site.

A copy of the communication, which the Executive Committee have addressed to the Council of the Royal Society, is appended for the information of the General Board.

The exact terms under which Bushey House is to be held have not been settled, but at the request of the Treasury an estimate has been made by the Office of Works of the cost necessary to make it suitable for a Laboratory. This estimate, which amounts to £14,296, includes the provision of a new Engineering Laboratory, and the erection of a Boiler House and Engine Room, together with the cost of an engine and dynamo for the supply of light and power. The Committee have been informed that in view of this expenditure the Government intend to ask Parliament to increase their Grant for capital outlay from £12,000 to £14,000.

Work, in the meantime, has been going on in the buildings of the Kew Observatory. The control of the work carried on by the Kew Committee of the Royal Society, appointed under the provisions of the Gassiot Trust Deed of June 29, 1871, was taken over by the Executive Committee from the 1st of January, and the property held by that Committee was handed over to the Royal Society for the purposes of the Laboratory as from that date.

The Committee, which was incorporated as a Public Company, has since been dissolved. The work at Kew Observatory has been continued in all its branches. A detailed account will be published later. It may, however, be stated that the total number of instruments

tested up to the end of September is largely in excess of the corresponding number for any previous year.

Among the pieces of work which have increased in importance during the year may be mentioned the testing of telescopic sights for the naval guns. The Director has also been in correspondence with the War Office authorities with regard to the testing of aneroids and watches. The magnetic work has grown, and the facilities for it have been greatly improved by the erection of a second house for magnetic observations. Captain Denholm Frazer, R.E., who is in charge of the Indian Magnetic Survey, has been working at the Laboratory during a great part of the summer, making himself acquainted with the methods of measurement, and testing the instruments to be used in India.

A new workshop and packing-house have been built, and the space thus set free, with the adjacent platinum thermometer room built in 1897, has been utilized as a Laboratory for the Director. Some of the electrical apparatus of the British Association has been fitted up in this room, and during the summer a series of comparisons of the standard coils was made. Experiments in platinum thermometry have been continued, and valuable results are being accumulated. The air thermometer, given by Sir Andrew Noble, has been erected in this Laboratory by Dr. Harker, and is now nearly ready for use.

The new workshop has been fitted with certain necessary tools, and a mechanic has been for some little time at work making apparatus for use in the Laboratory.

The Committee have to thank various donors for gifts. Sir Andrew Noble has contributed £1,000 for the purchase of apparatus. Dr. Isaac Roberts has given a spectroscope and two very valuable induction coils. Dr. Common has provided apparatus for determining the magnifying power and testing the collimation error of the telescopic sights, and has promised a large flat surface for optical work. Mrs. Sworn has given the collection of thermometers used by her late husband.

The financial position is for the present satisfactory; the financial year closes on December 31, and the audited accounts will be presented later. During the past year the erection of the workshop and magnetic room, and the fitting of the laboratory have been a cause of exceptional expenditure, amounting to about £475, while about £250 has been spent in apparatus and tools; but the additional staff appointed since the Kew Observatory was taken over consists only of the Director and a mechanic. Thus the income for the year will be in excess of the expenditure; there is every prospect, moreover, that the fees for testing will show an increase.

In accordance with the scheme of organization this report is made up to September 30, 1900. The Executive Committee desire to bring before the General Board the suggestion that in future their report should end with the close of the calendar year, being brought down to December 31 in each year. It would then be possible to include audited copies of the accounts, and a complete statement of the results of the year's work.

Copy of Resolution adopted by the Executive Committee for transmission to the Council of the Royal Society at their meeting on October 24, 1900:—

"That a copy of Sir F. Mowatt's semi-official communication be forwarded by this Committee to the Council of the Royal Society: that the Executive Committee report to the Council of the Royal Society that, while they consider that there are several reasons for preferring the site in the Old Deer Park at Richmond—which was recommended by the Treasury Committee and approved by the Treasury—the Committee are of opinion that a reasonably satisfactory National Physical Laboratory can be provided on the Bushey site, and they do not recommend the Royal Society to further oppose the arrangement which the Treasury, with the approval of Her Majesty, have adopted.

"The Executive Committee note with satisfaction that the Lords Commissioners propose to ask Parliament to grant an additional £2,000, in order to provide for capital outlay in the next financial year.

"They cannot, however, conceal from themselves that it will be very difficult for them to maintain and administer a National Physical Laboratory on the Bushey site for the amount annually allowed by the Treasury, and they fear that it may be necessary for them to press in the near future for an addition to that allowance."

October, 1900.

STATEMENT AS TO WORK TO BE UNDERTAKEN IN THE YEAR, OCTOBER 1, 1900, TO SEPTEMBER 30, 1901.

Under this head it may be useful to give a brief summary of the investigations which, in the opinion of the Sub-Committees appointed to draw up suggestions as to work, might be usefully undertaken. At the same time it must be pointed out that until the new buildings are available, few, if any, of these investigations can be carried out. For the present it seems best to develop the work which has been carried on at Kew for some time past, rather than begin new experimental work.

Thus the testing work will go on, and in some respects be extended. The Committee have received communications from the Board of Agriculture with regard to the testing of certain apparatus used in the Dairy Industry, while the Director has been in communication with various firms as to the testing of burettes, flasks, &c. It is hoped that it may be possible at once to take up this work.

The Laboratory has now conveniences for platinum thermometry; as one result of the Director's visit to Berlin, it appeared desirable to have a comparison between the high temperature scale in use here, and that employed at the Reichs-Anstalt. Thanks to the courtesy of President Kohlrausch and the officials of the Reichs-Anstalt, arrangements for this are now in progress. The work with the gas thermometer will continue, and the Committee hope, during the year,

to have Sir A. Noble's instrument in order as a standard of temperature.

The fact that the B.A. Standards have been placed in the Laboratory renders possible some necessary work on Electrical Units, in particular the construction of mercury resistance standards. Preliminary steps have been taken with this object.

Sub-Committees were appointed, as has been mentioned already, for the purpose of drawing up a series of suggestions as to the work which might most usefully be carried out in connection with the following branches of science or industry:—

Mechanics and Engineering,
Electricity,
Optics,
Chemistry,
Meteorology,
Terrestrial Magnetism,
Thermometry,
Legal Standards,

and the following is an analysis of their principal recommendations:—

Three Sub-Committees—viz., those for Mechanics, Chemistry, and Electricity—mentioned practically the same investigation as that to which attention ought in the first instance to be devoted. The terms of the recommendation of the Electrical Sub-Committee are as follows:—

"The connection between the magnetic quality and the physical, chemical, and electrical properties of iron and its alloys, with a view specially to the determination of the conditions for low hysteresis and non-ageing properties."

The other recommendations refer specially to the work of Sir W. Roberts-Austen and the Research Committee of the Institute of Mechanical Engineers. It would seem therefore to be desirable to provide for this work.

Another important task suggested by the Mechanics Committee, which ought moreover to prove remunerative, is the testing of various gauges and dynamometers, indicator springs, and the like, and also of gauges of various kinds used in Engineering practice. The necessity of further investigation into the methods of measuring wind pressure was also urged.

The Electrical Sub-Committee give the second place to the testing and calibration of electrical and magnetic instruments, as also of samples of iron used for transformers, and other magnetic purposes. This work again ought to be remunerative.

The Chemistry Sub-Committee suggest investigations into the conductivity for heat and co-efficient of transmission of radiation of various substances in general, and also as bearing on the question of gaseous fuel.

The Sub-Committee on Thermometry describes the present thermometric work of the Laboratory, and expresses the opinion that it ought to be developed—

(1.) By extending the range of temperature over which thermometers are tested.
(2.) By providing for (*a*) gas thermometry, (*b*) electric thermometry.
(3.) By arranging for a more exact study of the mercury in glass thermometers.

The Sub-Committee on Electricity again calls attention to the necessity of investigation into certain electrical measurements, and Mr. A. P. Trotter, at the request of the Committee on Legal Standards, has submitted a valuable list of measurements, by means of which the work of the Electrical Laboratory of the Board of Trade would be supplemented and assisted.

The Sub-Committee on Optics recommend that the work of testing telescopes, binoculars, photographic lenses and sextants should be extended, and that microscopes and certain other instruments should also be tested.

At the request of the Sub-Committee on Legal Standards, Mr. Chaney has furnished a statement as to instruments verified by the Standards Department of the Board of Trade, with suggestions as to investigations in which the Laboratory might assist the Department.

The Sub-Committee on Terrestrial Magnetism, in view of the doubt as to whether Kew can be sufficiently protected against magnetic disturbances due to tramways, do not recommend any immediate and expensive changes in this department, but they point out that, if Kew is to continue to rank with stations such as Potsdam and Pawlowsk, the extension of the Observatory will be necessary in the not very distant future, and that this will involve a considerable outlay.

October, 1900.

REGULATIONS FOR ADMINISTERING THE GOVERNMENT GRANT FOR SCIENTIFIC INVESTIGATIONS.

I.

1. The Government Grant shall be administered by a General Committee, consisting of the President and Council of the Royal Society for the time being, of the following *ex officio* Members:—

The President of the Royal Society of Edinburgh and one other Representative,
The President of the Royal Irish Academy and one other Representative,
The Presidents of—
The British Association,
The London Mathematical Society,
The Royal Astronomical Society,
The Physical Society,
The Institution of Civil Engineers,
The Institution of Mechanical Engineers,
The Institution of Electrical Engineers,
The Chemical Society,
The Iron and Steel Institute,
The Geological Society,
The Royal Geographical Society,
The Linnean Society,
The Zoological Society,
The Anthropological Institute,
The Royal College of Physicians,
The Royal College of Surgeons,

and of the Members, for the time being, of the several Boards hereinafter spoken of.

2. Seven Boards shall be established, viz.:—

A. For the consideration of Applications relating to Mathematics, Mathematical Physics, Crystallography and Mathematical Astronomy.
B. For the consideration of Applications relating to Experimental Physics, Observational Astronomy, and Meteorology.
C. For the consideration of Applications relating to Chemistry and Metallurgy.
D. For the consideration of Applications relating to Geology, Palæontology, Mineralogy, and Geography.
E. For the consideration of Applications relating to Botany.

F. For the consideration of Applications relating to Zoology and Comparative Anatomy.

G. For the consideration of Applications relating to (Animal) Physiology and Medical Subjects.

3. Each Board shall consist of eight members, to be appointed by the President and Council of the Royal Society, Scotland and Ireland being as far as possible represented on each Board, and each member shall serve for four years, so that two retire annually, and be not eligible for re-appointment on the occasion of their retiring. Should a vacancy occur by reason of death or otherwise, at any intermediate time, the Council shall appoint a person to fill the vacancy, and the person so appointed shall retire at the time the member whose place he fills would have retired had he continued until then to be a member, but if he have not served more than two years shall be eligible for re-appointment.

4. The President and Council of the Royal Society shall appoint a member of each Board to be Chairman of the Board. All communications made to and by the Board shall be made through the Chairman, who shall be held responsible for the management of the business of the Board, and who shall have a second or casting vote. When a Chairman is unable to perform the duties of the Chair, he shall appoint a member of the Board to act as his deputy, and to exercise his powers.

II.

5. In order to meet any extraordinary demands which may be made upon the Grant, a Reserve Fund shall be gradually accumulated, but so that it shall not at any time exceed £2,000.

6. A Grant, the payment of which is intended to be completed within the twelvemonth following upon the meeting of the Committee at which the Grant was made, shall be called an "ordinary" Grant. The Committee shall, however, if they see fit, make Grants for "personal" or other expenditure, each of which may extend over a period not exceeding three years, but in no case shall such a personal Grant exceed £300 per annum. For this purpose the Committee may, in any one year, reserve from the Fund of the year an amount sufficient to cover the payment during the period for which the Grant has been made, the continuance of the payment of the instalments of such Grants to be conditional on the recipients furnishing, as hereinafter provided, evidence satisfactory to the Committee that the object of the Grant is being properly carried out. Such Grants shall be called "extended" Grants.

III.

7. Adequate notice shall be given in the public papers each year that applications for Grants must be sent in to the Royal Society

not later than the last day of January, and no applications received after that date shall be considered by the Committee of that year.

8. Each applicant shall be required to furnish information under the following heads:—

a. The nature of the research in which he desires to engage, and of the scientific results expected to follow therefrom.

b. The amount asked for.

c. Whether he has received any previous Grant from any source for the same object, and if so, with what results.

d. Whether any portion of the Grant is to be devoted to his own personal expenses.

e. What apparatus, if any, of permanent value he will require; so that any instruments, already at the disposal of the Committee, may be utilised.

9. As soon as possible after February 1st in each year, the Secretaries of the Royal Society shall cause to be drawn up a list of all the applications, arranged, according to the nature of the research in each application, in classes corresponding to the above-mentioned Boards, and shall cause such list to be distributed to all Members of the Committee. This list shall contain a brief statement of the information received under Clause 8.

10. The Secretaries of the Royal Society shall further cause to be sent to the Chairman of each Board a list of the applications belonging to the class corresponding to his Board, together with any other information, letters, documents, &c., which may have been furnished by the several applicants.

11. Each Board, having taken into consideration the applications submitted to it, making such use of correspondence between Members of the Board as may be desirable for the purpose, shall send to the Secretaries of the Royal Society, some day in May to be determined each year by the President and Council of the Royal Society, a written Report, stating, with reference to each such application, whether they recommend the acceptance of it in part or in whole, or the rejection of it; and the Secretaries of the Royal Society shall cause the Reports of the several Boards to be distributed as soon as possible to all Members of the Committee.

12. Should any application appear to the Secretaries of the Royal Society to relate to more than one Board, they shall, with the approval of the President of the Royal Society, refer the application to the several Boards to which it appears to relate. In such cases the Chairman of one of the Boards concerned shall, on the nomination of the President of the Royal Society, be requested to take charge of the application, to be responsible for its being laid before the Boards concerned, and to present the Report of those Boards on

the application at the same time that he presents the usual Report of his own Board.

13. It shall be in the power of any Board to initiate an inquiry and to recommend a Grant for the purpose, and such a recommendation having been reported to the Committee with the other recommendations of the Board, shall take its place among applications recommended to the Committee for acceptance, in spite of application not having been made in the ordinary way.

14. The Committee shall meet on the third Wednesday (or, if that fall in Whitsun Week, the fourth Wednesday) in May, at which meeting the Reports of the Boards shall be read, considered (the Chairman of each Board, or in his place some other Member of it, giving such explanations with regard to the decisions of the Board as may seem desirable), and voted upon. The voting shall be by show of hands, unless any Member demands a ballot, in which case it shall be by ballot.

15. In the case of applications which have been recommended by the appropriate Board, or recommendations initiated by any Board, the voting in Committee shall be by simple majority of those present, except in the case of "extended" Grants coming under Clause 6, which Grants shall require the assent of two-thirds of those present.

16. Applications which have been rejected by the appropriate Board shall not be reconsidered in Committee except with the consent of two-thirds of those present, and any applications so reconsidered shall not be granted by the Committee otherwise than by a majority of two-thirds; likewise a proposal to increase the amount of any Grant made by a Board shall not be considered in Committee except with the consent of two-thirds of those present, and the increase so considered shall not be granted by the Committee otherwise than by a majority of two-thirds.

17. The Committee shall have power to place each year at the disposal of the President and Council of the Royal Society, a sum not exceeding £500 to meet any pressing demands upon the Fund which may be made between the annual meetings of the Committee.

18. The President of the Royal Society shall further have power, in case he is of opinion that there is urgency for an immediate Grant of a sum too large to be provided by the Fund referred to in 17, and necessitating a call upon the Reserve Fund, to summon a Special Meeting of the Committee, who, if they see fit, shall decide on such Grant, provided always that due notice of such meeting, with a statement of the purpose for which it is called, be sent to each Member of Committee fifteen days before the date fixed for the meeting.

IV.

19. All Grants shall be subject to the following conditions, and every applicant shall, on his applying, be duly informed of these conditions:—

i. That all instruments, specimens, objects, or materials of permanent value, whether purchased or obtained out of, or by means of, the Grant, or supplied from among those at the disposal of the Committee, are to be regarded, unless the Committee decide otherwise, as the property of the Government, and are to be returned by the applicant, for disposal according to the orders of the Committee, at the conclusion of his Research, or at such other time as the Committee may determine.

ii. That every one receiving a Grant shall furnish to the Committee, on or before the 31st of January following upon the allotment of the Grant, a Report (or, if the object of the Grant be not then attained, an interim Report, to be renewed at the same date in each subsequent year until a final Report can be furnished), containing (*a*) a brief statement showing the results arrived at, or the stage which the inquiry has reached; (*b*) a general statement of the expenditure incurred, accompanied, so far as is possible, with vouchers; (*c*) a list of the instruments, specimens, objects or materials, purchased or obtained out of the Grant, or supplied by the Committee, which are at present in his possession; and (*d*) references to any Transactions, Journals, or other publications in which results of the Research have been printed.

iii. That when a Grant is asked for a definite Research, for which an estimate can be obtained, applicants are required, with their applications, to furnish such an estimate.

iv. That when an application is for a Grant to two or more persons to act as a Committee for the purpose of carrying out some scientific object, the application shall state which Member of the proposed Committee is willing to act as Secretary, to be responsible for furnishing the Report, for receiving and disbursing the money, and in general for the conduct of the business of the Committee.

v. That Grants shall lapse at the end of two years from the date of allotment, if application for payment be not made within that time.

vi. That papers in which results are published which have been obtained through and furnished by the Government Grant, should contain an acknowledgment of that fact.

The Committee shall further have power to attach to any Grant any other conditions which they may think desirable.

20. Every applicant to whom a Grant is made shall, before any of the Grant is paid to him, be required to sign an engagement (which may be incorporated in the receipt for the money) that he is prepared to carry out the general conditions applicable to all Grants, as well as any conditions which may be attached to his particular Grant.

21. Printed copies of the Reports, provided for by Regulation 19, § ii, shall each year, so soon as possible after January 31, be submitted to the several Boards; and it shall be the duty of each Board to examine the Reports relating to Grants recommended by it, and to report to the Committee (or, in case of urgency, to the Council of the Royal Society) any deficiencies therein, or any action relating thereto which the Board thinks desirable.

22. In the case of a Grant recommended by a Board being for the purpose of enabling the applicant to collect by means of the Grant, or part of it, specimens, objects, or materials of permanent value, the Board shall, whenever it is able to do so, add to its recommendation conditions as to the final disposal of such specimens, objects, or materials.

23. When an application is for a Grant to two or more persons to act as a Committee for the purpose of carrying out some scientific object, the application shall state which Member of the proposed Committee is willing to act as Secretary, to be responsible for furnishing the Report, for receiving and disbursing the money, and in general for the conduct of the business of the Committee.

24. The recipient of an "extended" Grant shall make to the Board which recommended the Grant, half-yearly, or, if the Board desire it, oftener, such Reports as the Board may determine concerning the way in which the object of the Grant is being carried out; and each such recipient shall, on receiving notice that the Grant has been made to him, be informed of his duty to make such Reports, and shall express in writing his willingness to do so. Should any Board be of opinion, after receiving such Reports, that the object of the Grant is not being properly carried out, they shall report the same to the next meeting of the Committee. The Chairman of the Board shall move at the meeting of the Committee that the Grant be discontinued, and if the Committee by a majority approve of the Grant being discontinued, it shall be discontinued.

V.

25. The duties of Clerk to the Committee and other business incidental thereto may be performed by the staff of the Royal

Society; and the sum of £200 shall be yearly placed at the disposal of the Council for salaries and incidental purposes.

26. A Schedule shall be kept of all instruments, specimens, &c., of permanent value, in furtherance of Regulation 19, and of Clause *e* of Regulation 8.

27. A Professional Accountant shall be employed to audit the accounts in chief, and to conduct the preliminary examination of the detailed accounts and vouchers. Such accountant shall be instructed to submit to the Chairman of the appropriate Boards the cases concerning which he is not satisfied; and the Chairman of a Board shall be requested to examine, with the assistance of one or more Members of his Board, any such case so submitted to him, and to take such action as may seem to him desirable.

APPENDIX TO THE GOVERNMENT GRANT REGULATIONS.

I.

Instructions for the Government Grant Boards.

(*Minutes of Council, March* 15, 1894.)

1. Each Chairman has authority to summon his Board, whenever he thinks fit (in addition to any Meeting or Meetings of the Board which may be appointed by the Council), to meet either at the Rooms of the Royal Society, during the hours specified in the Statutes (chap. xiv, § 7), or at such other place as he may deem desirable.

2. The summonses are to be issued by the Clerk at the direction of the Chairman.

3. Any four members of a Board are to be a quorum of that Board; but the decisions arrived at at a Meeting of a Board at which less than four members are present shall be valid, if subsequently agreed to in writing by not less than five members in all.

4. It is desirable that each year a Meeting of each Board should be held at the Society's Rooms soon after the receipt by the Chairman of the applications, and that another Meeting to come to final decisions on the applications should be held, also at the Society's Rooms, on the day fixed by the Council; but the Chairman may, if he finds it desirable, change the day of the latter Meeting, and he may even omit the one or the other of these Meetings, should he judge the one or the other to be unnecessary.

5. If the Chairman of a Board, on receiving a list of applications under Regulation 10, shall find that any application on that list is, in

his opinion, more appropriate to another Board than his own, or that any application which ought, from its nature, to have been referred to a Board or to Boards besides his own, is referred only to his own Board, or that an application proper to his Board has been referred to another Board, he shall at once report the same to the Secretaries of the Royal Society.

6. The Chairman of a Board may authorise the transfer of any instrument, specimen, &c., obtained by means of a Government Grant, and no longer needed by the person by whom it was obtained or to whom it was assigned, to any other person applying to the Government Grant Committee for the loan of the instrument, specimen, &c., if in his judgment such a transfer is desirable. He shall in each case report his having done so to the Secretaries of the Royal Society.

7. The Chairman of each Board is expected to see that the Annual Reports* furnished by Grantees give an adequate account of the work done and the results attained, and in cases where the Reports are inadequate, to inform the Clerk of the fact in order that he may communicate with such Grantees.

8. The Chairman of a Board is requested to examine, with the assistance of one or more members of his Board, any case submitted by the Professional Accountant in pursuance of Regulation 27, and to take such action as may seem to him desirable.

II.

INSTRUCTIONS FOR A COMMITTEE APPOINTED FOR THE PURPOSE OF ADMINISTERING A GRANT UNDER SECTION 23 OF THE GOVERNMENT GRANT REGULATIONS.

(*Minutes of Council, February* 22, 1895.)

1. The Secretary of the Committee has authority to call a Meeting of the Committee whenever he thinks desirable, either at the Rooms of the Royal Society, during the hours specified in the Statutes (chap. xiv, § 7), or at such other place as he may deem desirable.

2. The summons for each such Meeting shall be issued by the Clerk, from the Society's Apartments.

3. To constitute a quorum, at any meeting of the Committee, at least one-half of the Members of the Committee, the Secretary being one, must be present.

4. The provisions of Regulation 19 apply in all particulars to a Committee as well as to an individual applicant, and every Com-

* By "Report" is not meant a complete scientific exposition of the inquiry, but such a statement as will show that the Grantee has expended the money for the purpose mentioned in his Application, and will briefly indicate to what extent he has attained the objects of the inquiry.

mittee receiving a Grant is to continue (subject to any decision to the contrary by the Council of the Royal Society, or by the General Committee) until such time as the final Report upon their research has been furnished.

5. When a Committee is re-appointed, with or without change as to the persons composing it, for continuing a research, and receiving a new Grant, it is to be considered a new Committee for all purposes of expenditure and reporting, and is in no way responsible for expenses incurred by its predecessor.

The above instructions are intended only for the cases in which a Committee is especially constituted in order to receive a Grant. Grants may be made to already existing Committees established independently of any application for a Grant. In such cases the above instructions are not intended to apply, and the procedure of meetings, constitution of quorum, &c., of such a Committee must be determined in each case by the Committee itself. In all such latter cases the Chairman or Secretary of the Committee, or some other person, must be authorised by the Committee to be the responsible representative of the Committee in question before the Government Grant Committee, to make application to receive moneys, to furnish reports, &c., &c.

December 1, 1898.

GOVERNMENT GRANT BOARDS, 1901.

Board A.

Chairman—Major MacMahon.

	Retire March 1st.
* *Prof. Chrystal, Dr. Larmor*	*1901*
Prof. Forsyth, Prof. Greenhill	1902
Mr. Basset, Prof. H. H. Turner	1903
Prof. Burnside, Prof. Love	1904
Prof. Hill, Major MacMahon	1905

Board B.

Chairman—Prof. G. Carey Foster.

Sir Wm. Abney, Prof. Fitzgerald	*1901*
Mr. S. Bidwell, Lord Kelvin	1902
Prof. Fleming, Prof. G. Carey Foster	1903
Prof. Callendar, Mr. McClean	1904
Mr. Glazebrook, Prof. Joly	1905

* Members whose names are in italics serve only *until* March 1, 1901. The two members named last on each Board serve only *from* March 1, 1901.

BOARD C.

Chairman—Dr. Gladstone.

	Retire March 1st.
Prof. Crum Brown, Dr. Thorpe	*1901*
Prof. Dunstan, Sir W. C. Roberts-Austen	1902
Prof. Liveing, Prof. Ramsay	1903
Prof. McLeod, Dr. H. Müller	1904
Dr. Gladstone, Prof. Japp	1905

BOARD D.

Chairman—Mr. Hudleston.

Dr. Blanford, Mr. Teall	*1901*
Prof. Judd, Prof. Dawkins	1902
Mr. L. Fletcher, Mr. J. E. Marr	1903
Mr. Hudleston, Lieut.-Gen. McMahon	1904
Prof. Seeley, Admiral Sir W. Wharton	1905

BOARD E.

Chairman—Dr. D. H. Scott.

Prof. J. R. Green, Prof. Vines	*1901*
Mr. Gardiner, Prof. Oliver	1902
Sir E. Fry, Mr. G. Murray	1903
Mr. Seward, Prof. J. W. H. Trail	1904
Mr. H. T. Brown, Dr. D. H. Scott	1905

BOARD F.

Chairman—Mr. Godman.

Prof. Hickson, Prof. Macalister	*1901*
Mr. Godman, Prof. J. C. Ewart	1902
Mr. Elwes, Prof. Poulton	1903
Prof. A. Newton, Prof. Weldon	1904
Prof. Cunningham, Prof. Miall	1905

BOARD G.

Chairman—Prof. Ferrier.

Prof. McKendrick, Prof. Sherrington	*1901*
Prof. W. Watson Cheyne, Dr. Waller	1902
Prof. Ferrier, Prof. Schäfer	1903
Dr. Langley, Dr. Sidney Martin	1904
Sir T. Lauder Brunton, Prof. Gotch	1905

Account of the Appropriation of the Sum of £4,000 (the Government Grant) annually voted by Parliament for Scientific Investigations.

April 1, 1899, to March 31, 1900.

	£	s.	d.
Prof. H. H. Turner, for the Measurement and Reduction of the Astrographic Chart Plates taken at the University Observatory, Oxford	150	0	0
Prof. E. W. Brown, for a New Calculation of the Inequalities produced in the Motion of the Moon by the Action of the Sun	100	0	0
Dr. G. Johnstone Stoney, for Further Research on the Actual Perturbations suffered by a Definite Station in the Leonid Stream of Meteors during its Current Revolution	30	0	0
A. E. Tutton, for Continuation of Research on the Relations between the Crystallographical Character of Isomorphous Salts and their Chemical Composition	30	0	0
E. Edser, for a Research on the Velocity of Light in Moving Liquids	100	0	0
Thomas Preston, for a Research on Radiation Phenomena in very Intense Magnetic Fields	75	0	0
Prof. J. T. Morrison and Dr. J. C. Beattie, in Aid of a Magnetic Survey in S. Africa	150	0	0
Prof. H. L. Callendar, for a Research on the Absolute Expansion of Mercury	200	0	0
W. Plummer, for Procuring Photograms with a Seismograph and the Discussion of Earth-waves of Long Period and Small Amplitude Perpendicular to the Meridian	30	0	0
Joint Permanent Eclipse Committee, for the Observation of the Total Solar Eclipse of May 27–28, 1900	250	0	0
Prof. J. C. Bose, for a Research on the Properties of Electric Waves	10	0	0
W. F. Denning, for (1) the Observation of Meteors; (2) the Search for New Comets; (3) the Completion of a General Catalogue of the Radiant Points of Shooting Stars (*personal*)	25	0	0
W. G. Walker, for a Research on the Resistances of Surfaces and Bodies in Air	25	0	0
Carried forward	£1,175	0	0

Brought forward.....	£1,175	0	0
L. Blaikie, for a Research on the Potential required to produce a Spark Discharge in Different Gases at Different Sparking Distances	25	0	0
S. W. Richardson, for a Research on the Magnetic Properties of Alloys of Iron and Manganese	15	0	0
Dr. J. H. Vincent, for a Research with a View to Determine the Density of Pure Ice at 0° C., and to Find the Latent Heat of Ice in Terms of some Definite Thermal Unit	25	0	0
E. H. Griffiths, for an Investigation into the Freezing Points of very Dilute Solutions	35	0	0
W. C. D. Whetham, for a Research on the Electrical Conductivity of Solutions to their Freezing Points	70	0	0
Dr. W. A. Bone, for Payment of an Assistant in Further Research on the Direct Union of Carbon and Hydrogen	25	0	0
Prof. Japp, for Further Investigation of the Reactions of Ketones, Diketones, and Allied Compounds, and of the Alkyl Derivatives of Amarine	50	0	0
Prof. Sydney Young, for a Research on the Specific Volumes, the Vapour Pressures, and the Critical Constants of some of the Paraffins and other Hydrocarbons	30	0	0
Prof. W. Ramsay, for a Research on the Isolation of the Gases in Air which are mixed with Crude Argon ...	75	0	0
Prof. W. N. Hartley, for Continuation of Researches on the Relationship of the Absorption Spectra to the Chemical Constitution of Organic Substances.....	50	0	0
Dr. A. W. Gilbody and Prof. W. H. Perkin, jun., for Continuation of Researches on Brazilin and Hæmatoxylin, and for Further Research on Camphor, Camphoric Acid, and Allied Substances.....	100	0	0
Dr. E. P. Perman, for a Research on the Vapour Density of Bromine at Various Temperatures from 500° C. upwards	5	0	0
Prof. F. S. Kipping, for a Research on Optically Active and Externally Compensated Substances	25	0	0
W. J. Pope, for a Research on the Application of the Dissociation Theory to Optical Activity.....	70	0	0
Dr. F. M. Perkin, for a Research on Baeyer's Isocamphoronic Acid	15	0	0
Carried forward.....	£1,790	0	0

Brought forward	£1,790	0	0
Messrs. Easterfield, Spivey, and Wood, for a Continuation of a Research upon the Chemical Constituents of Indian Hemp	20	0	0
G. B. Cockburn, for a Research on Fencholenic Acid	10	0	0
Dr. W. B. Davidson, for Determination of the Rato of Migration of the Hydroxyl Ion	10	0	0
W. J. Sell, for the Investigation of Citrazinic Acid and of the Pyridine Derivatives	50	0	0
Dr. W. Palmer Wynne, for Further Researches on Pure Chloro- and Dichloro-derivatives of Benzene and Toluene	60	0	0
H. J. H. Fenton, for Researches arising from the Observation of a New Colour Reaction of Tartaric Acid	60	0	0
Prof. Percy Frankland, for Further Researches on Optically-active Compounds	75	0	0
J. S. Flett, for a Research on the Age of the Old Red Sandstone of Shetland	12	0	0
H. Stanley Jevons, for a Geological Survey of the Berwyn Hills, N. Wales	25	0	0
Sir A. Geikie, for the Preparation and Publication of a Geological Map of Europe, under the Authority of the International Geological Congress (further instalment)	75	0	0
R. Kidston, for Further Research into the Horizontal and Vertical Distribution of the Carboniferous and Old Red Sandstone Floras	25	0	0
J. S. Gardiner, for a Research on the Structure and Formation of the Coral Reefs of the Indian Ocean	300	0	0
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Dr. Otto V. Darbishire, for a Research on Sexual Reproduction in Lichens	25	0	0
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H. Hanna, for a Research on the Life History of the Alga Genus *Halosphœra*	30	0	0
Miss Lily H. Huie, for Further Researches on Cell-physiology, and particularly on the Special Functions of Nucleus and Cytoplasm	25	0	0
Carried forward	£2,742	0	0

Brought forward	£2,742	0	0
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Prof. W. A. Herdman, toward the Cost of obtaining Specimens for a Detailed Monograph on the British Tunicata	50	0	0
D. Sharp, for Further Investigation of the Fauna of the Sandwich Islands	200	0	0
Prof. J. C. Ewart, for a Research on the Development of the Horse, and Experiments on Reversion, Inbreeding, and Prepotency	150	0	0
J. P. Hill, for Further Researches into the Embryology of Marsupials and Monotremes	100	0	0
R. Newstead, to obtain Material for a Monograph upon the Coccidæ	20	0	0
Evolution Committee (per Prof. Weldon), for Further Investigations into the Measurable Characteristics of Animals and Plants	50	0	0
J. W. Washbourn, for the Continuation of Researches upon the Pneumococcus	30	0	0
H. L. Barnard, for Continuation of his Research on the Exact Mode of Action of Cardiac Drugs, and more especially of Anæsthetics	30	0	0
Dr. Swale Vincent, for a Research on the Changes in the Lymphatic and Hæmal Lymphatic Glands in Dogs after Removal of the Spleen	40	0	0
Prof. W. D. Halliburton, for Further Researches on (1) the Physiological Action of Choline, Neurine, and Allied Substances; (2) the Chemistry of Reticular Tissue	40	0	0
J. Barcroft, for a Research on the Gaseous Metabolism of the Submaxillary Gland	20	0	0
H. M. Vernon, for Researches on (1) Heat-rigor in Cold-blooded Animals; (2) the Effects of Environment on the Development of Echinoderm Larvæ	6	0	0
E. H. Starling, for a Research on the Mutual Independence of Motor Activities of Various Parts of the Alimentary Canal and the Action of Diuretics	40	0	0
Prof. J. T. Cash, for a Research on the Action and Toxicity of Japaconitine, Pseudaconitine, and other Allies and Derivatives	20	0	0
Carried forward	£3,553	0	0

Brought forward.....	£3,553	0	0
H. H. Dale, for a Comparison of the Nerve Fibres given off peripherally from a Spinal Ganglion with those given off towards the Spinal Cord	10	0	0
Dr. Leonard Hill, for a Research on (1) the Effect of Increased and Diminished Atmospheric Pressure on the Circulation of the Blood; (2) the Respiration and Circulation of Birds; (3) the Permeability of the Lungs to Gases	20	0	0
Dr. M. S. Pembrey, for Further Research upon the Respiratory Exchange during Hibernation, and the Regulation of Temperature in Man and Animals	20	0	0
Dr. H. K. Anderson, for a Research on the Myelination of Peripheral Nerves.....	20	0	0
Dr. Lorrain Smith, for Further Research on the Pathology of Respiration	40	0	0
Prof. Vaughan Harley, for a Research on the Respiratory Gas Exchange from the Tissues and Lungs in Certain Lesions	20	0	0
Dr. J. L. Bunch, for Researches on (1) the Effects produced in Animals by the Injection, Subcutaneously and Intravenously, of Salts of Mercury and other Drugs; (2) the Innervation of the Intestine	30	0	0
Dr. J. S. Haldane, for Researches on (1) the Physiology of Respiration; (2) the Abnormal Atmosphere met with in Coal-mines, &c.	25	0	0
Prof. W. H. Thompson, for Further Research into the Physiological Effects produced by the Injection of Peptone and its Precursors when injected into the Circulation	30	0	0
Tzetze-fly Committee.....	100	0	0
G. J. Burch, for a Research on Colour Vision	10	0	0
A. C. Hill, for a Further Research on the Properties of Enzymes.....	25	0	0
W. M. Fletcher, for an Addition to the Apparatus used in his Research on CO_2 given off by Muscle in Different Conditions of Activity	3	1	5
G. A. Boulenger, in Aid of Expenses of Making Collections from Senegal River for the Purpose of Completing his work on the Fresh-water Fish Fauna of Africa	100	0	0
W. Ogilvie Grant, towards the Expenses of sending Mr. A. B. Percival and a Taxidermist to make Zoological			
Carried forward.....	£4,006	1	5

	£	s.	d.
Brought forward.....	£4,006	1	5
Collections in Arabia in connection with General Creagh's Expedition from Aden	75	0	0
Meteorological Council, in aid of Mr. C. T. Wilson's Researches in Atmospheric Electricity	100	0	0
Sir Norman Lockyer, for the Purchase of an Achromatic Lens of 6 inches aperture and 20 feet focal length to be used by him in observations of the 1900 Eclipse...	100	0	0
	£4,281	1	5

Reserve Fund.

Joint Permanent Eclipse Committee.....	£250
Malaria Committee	300
	£550

Revenue Account.

1899-1900

General Fund.

Cr.

	£	s.	d.
To Appropriations as above £4,281 1 5			
Less amount unclaimed 13 15 0			
	4,267	6	5
„ Administrative Expenses	231	16	0
„ Transferred to Reserve Fund..... ..		8	6
„ Balance, Mar. 31, 1900 .	109	14	4
	£4,609	5	3

Dr.

	£	s.	d.
By Balance, April 1, 1899	512	4	7
„ Parliamentary Grant .	4,000	0	0
„ Miscellaneous Receipts	27	8	4
„ Repayments	69	12	4
	£4,609	5	3

Reserve Fund.

Cr.

	£	s.	d.
To Appropriations as above	550	0	0
	£550	0	0

Dr.

	£	s.	d.
By Balance, April 1, 1899	529	3	11
„ Transfer from General Fund.....		8	6
„ Balance over assigned	20	7	7
	£550	0	0

REGULATIONS GOVERNING THE USE OF THE LIBRARY OF THE ROYAL SOCIETY.

1.* The Library shall be open to the Fellows every week-day (exclusive of Good Friday and Easter-eve, of Easter week, of a week at Whitsuntide, and of a week at Christmas), from 11 A.M. to 6 P.M., except on Saturdays, when it shall be open from 11 in the morning to 1 in the afternoon; but during the months of August and September, it shall be closed on week-days other than Saturdays at 4 P.M.

2. Any Fellow may have the loan of any of the printed Books of the Society, excepting such as the Council shall order not to be taken out of the Library; but he shall not be allowed to have in his possession more than ten volumes at a time. The loan of Manuscripts is exclusively vested in the President and Council.

3. A List of all Books and Manuscripts borrowed from the Library of the Royal Society, and of the Fellows of the Society to whom they are lent, shall be kept in the Library.

4. All books whatsoever belonging to the Society, shall be returned at a time to be specified by the Council in each year; and the Library shall be closed for one month after such time, or for such shorter periods as the Council may direct.

5. The value of such Books in the possession of any Fellow as are not returned to the Library, pursuant to the preceding Statute, shall be required to be paid by the person who has so detained them.

6. No persons other than Fellows have the privilege of using the Library, except upon a written introduction from a Fellow, with whom rests the responsibility for all books entrusted to the person introduced. Every such introduction shall be valid only until the 1st August next ensuing.

7. Dictionaries, Cyclopædias, and works of general reference do not circulate.

8. Books of exceptional rarity, size, or value, are only allowed to circulate by special permission of the Council.

9. All books are borrowed subject to recall after one month's interval.

10. All books are returnable to the Library *on the 1st August in each year*, and no books can be borrowed during the month of August.

11. All applications for the use of the Library are to be addressed to the *Assistant Secretary and Librarian*, who is charged with the carrying out of these regulations.

Ordered by the Library Committee at their meeting on the 16th December, 1898.

* Regulations 1—5 are from the Statutes, ch. xiv.

ADDITIONS TO LIBRARY, 1899–1900.

Adams (Lieut.-Col. A.) The Western Rajputana States: a Medico-topographical and General Account of Marwar, Sirohi, Jaisalmir. 8vo. *London* 1899. From the Author.

Adams (J. C.), F.R.S. Scientific Papers. Vol. II. 4to. *Cambridge* 1900. From the Adams Memorial Committee.

Bachmetjew (P.) Über die Temperatur der Insekten nach Beobachtungen in Bulgarien. 8vo. *Leipzig* 1899. From the Author.

Balch (E. S.) Glacières or Freezing Caverns. 8vo. *Philadelphia* 1900. From the Author.

Basset (A. B.), F.R.S. An Elementary Treatise on Hydrodynamics and Sound. Second edition. 8vo. *Cambridge* 1900. From the Author.

Berlin:—Königl. Preuss. Akademie der Wissenschaften. Geschichte. 3 vols. Roy. 8vo. *Berlin* 1900. From the Academy.

—— Die Zweihundertjahrfeier der Akademie am 19 und 20 März 1900. 4to. *Berlin*. From the Academy.

Bjerknes (V.) Vorlesungen über hydrodynamische Fernkräfte nach C. A. Bjerknes' Theorie. Band I. 8vo. *Leipzig* 1900. From the Author.

British Museum. Handbook of the Coins of Great Britain and Ireland. By H. A. Grueber. 8vo. *London* 1900. From the Trustees.

—— Illustrations of the Botany of Captain Cook's Voyage round the World in H.M.S. "Endeavour" in 1768–71. By Sir J. Banks and D. Solander. Part I. Australian Plants. Folio. *London* 1900. From the Trustees.

Buchan (A.), F.R.S. Handy Book of Meteorology. 8vo. *Edinburgh* 1868. From the Author.

California University. The International Competition for the Phœbe Hearst Architectural Plan for the University. Oblong. [*San Francisco* 1899.] From the University.

Cambridge Philosophical Society. Memoirs presented on the occasion of the Jubilee of Sir George Gabriel Stokes. 4to. *Cambridge* 1900. From the Society.

Combined Experience of Assured Lives (1863–1893) deduced from the Records contributed by Companies in respect of Assurances effected within the United Kingdom. 8vo. *London* 1900.
From the Institute of Actuaries and the Faculty of Actuaries in Scotland.

Combined Experience of Life Annuitants (1863–1893) deduced from the Records contributed by Companies in respect of Annuities granted within the United Kingdom. 8vo. *London* 1899.
From the Institute of Actuaries and the Faculty of Actuaries in Scotland.

Cust (R. N.) Memoirs of Past Years of a Septuagenarian. 8vo. 1899. From the Author.

Davis (F.) The Romano-British City of Silchester. 8vo. *London* 1898. From the Author.

Downing (A. M. W.), F.R.S. Precession Tables adapted to Newcomb's Value of the Precessional Constant and reduced to the Epoch 1910·0. 4to. *Edinburgh* 1899. From the Author

Eiffel (G.) La Tour de Trois Cents Mètres. 2 vols. Atlas folio. *Paris* 1900. From the Author.

Fatio (V.) Faune des Vertébrés de la Suisse. Vol. II. Partie 1. 8vo. *Genève* 1899. From the Author.

Forsyth (A. R.), F.R.S. Theory of Differential Equations. Part I. 8vo. *Cambridge* 1890. From the Author.

Foster (Sir M.), Sec. R.S. A Text Book of Physiology. Sixth edition. Part IV. 8vo. *London* 1900. From the Author.

Galloway (W.) Course of Lectures on Mining. 8vo. *Cardiff* 1900. From the Author.

Gauss (C. F.) Werke. Band VIII. 4to. *Göttingen* 1900.
From the Königl. Gesellschaft der Wissenschaften, Göttingen.

Gesellschaft Deutscher Naturforscher und Aerzte. Die Entwicklung Münchens unter dem Einflusse der Naturwissenschaften während der letzten Dezennien: Festschrift. 4to. *München* [1899].
From the Bavarian Government, through the Foreign Office.

Gowland (W.) The Early Metallury of Copper, Tin, and Iron in Europe, as illustrated by Ancient Remains, and the Primitive Processes surviving in Japan. 4to. *London* 1899. From the Author.

Grünwedel (A.) Dictionary of the Lepcha-Language, compiled by the late General G. B. Mainwaring. 8vo. *Berlin* 1898. From the Government of India.

Hemprich (F. W.) and Ehrenberg, (C. G.) Symbolæ Physicæ seu Icones adhuc ineditæ Corporum naturalium . . . . Zoologica. Botanica. Atlas folio. *Berolini* 1899–1900. Purchased.

Huggins (Sir W.), F.R.S. and Lady Huggins. An Atlas of Representative Stellar Spectra from λ 4870 to λ 3300. Folio. *London* 1899. From the Authors.

Jacobi (M. H.) Über Electro-Telegraphic. 4to. *St. Petersburg* 1900.
From the Imperial Academy of Sciences, St. Petersburg.

Jervis (Guglielmo). I Tesori Sotterranei dell' Italia. Parte 4. Geologia Economica dell' Italia. 8vo. *Torino* 1889. Purchased.

Jones (F.) The Air of Rooms. 8vo. *Manchester* 1900.
From the Author.

Kayser (H.) Handbuch der Spectroscopie. Band 1. 8vo. *Leipzig* 1900. Purchased.

Latham (B.) The Climatic Conditions necessary for the propagation and spread of Plague. 8vo. *Edinburgh* 1900.
From the Author.

Lebon (E.) Histoire Abrégée de l'Astronomie. 8vo. *Paris* 1899.
From the Author.

Lemberg :—Ševčenko-Gesellschaft. Chronik. No. 1. 8vo. *Lemberg* 1900. From the Society.

Letts (E. A.) and Blake (R. F.) The Carbonic Anhydride of the Atmosphere. 8vo. *Dublin* 1900. From the Authors.

Lindman (C. A. M.) Vegetationen i Rio Grande do Sul (Sydbrasilien). 8vo. *Stockholm* 1900.
From the Royal Swedish Academy of Sciences.

Messina :—Università. CCCL Anniversario. Folio. *Messina* 1900.
From the University.

Müller (Johannes) Briefe an Anders Retzius, von dem Jahre 1830 bis 1857. 4to. *Stockholm* 1900. From the Royal Swedish Academy.

Nansen (F.) The Norwegian North Polar Expedition 1893–1896. Scientific Results. Vol. I. 4to. *Christiania* 1900.
From the Council of the Fridtjof Nansen Fund.

Nordstedt (C. F. O.) Index Desmidiacearum citationibus locupletissimus atque bibliographia. 4to. *Lundæ* 1896.
From the Royal Swedish Academy of Sciences.

Norman (J. H.) Lecture upon Locke's School of Money. 8vo. *London* 1900. From the Author.

Paget (S.) Experiments on Animals. 8vo. *London* 1900.
From the Association for the Advancement of Medicine by Research.

Paris :—Société de Biologie. Cinquantenaire. Volume Jubilaire. 8vo. *Paris* 1879. From the Society.

Portugal :—Direcção dos Trabalhos Geologicos. Carta Geologica de Portugal. 2 sheets. 1899. From the Survey.

Raciborski (M.) Parasitische Algen und Pilze Java's. Theil 1, 3. 8vo. *Batavia* 1900.
From the Author and Botanical Garden, Buitenzorg.

Ravenstein (E. G.) Martim de Bohemia (Martin Behaim). 8vo. *Lisboa* 1900. From the Author.

Rayleigh (Lord) Scientific Papers. Vol. I. 8vo. *Cambridge* 1899.
From the Author and the Syndics of the University Press.

Richard (J.) Les Campagnes Scientifiques de S.A.S. le Prince Albert Ier de Monaco. 8vo. *Monaco* 1900 [with two excerpts].
From H.S.H. the Prince of Monaco.

Richardson (Sir B. W.), F.R.S. Biological Experimentation, its Functions and Limits. 8vo. *London* 1896.
From the Leigh-Browne Trust.

Roberts (I.), F.R.S. Photographs of Stars, Star-clusters, and Nebulæ, together with Records of Results obtained in the pursuit of Celestial Photography. Vol. II. 4to. *London* [1900].
From the Author.

Sars (G. O.) An Account of the Crustacea of Norway. Vol. III. Parts 1 and 2. 8vo. *Bergen* 1899. From the Author.

Schiaparelli (G. V.) All' Astronomo G. V. S.—Omaggio. 4to. 1900.
From the Royal Observatory, Padua.

Scott (D. H.), F.R.S. Studies in Fossil Botany. 8vo. *London* 1900.
From the Author.

Spencer (Herbert). The Principles of Biology. Revised Edition. 2 vols. 8vo. *London* 1898–9. Purchased.

Studnička (F. J.) Prager Tychoniana, zur bevorstehenden Säcularfeier der Erinnerung an das vor 300 Jahren erfolgte Ableben des Reformators der beobachtenden Astronomie. 8vo. *Prag* 1901.
From the Author.

Tchebychef (P. L.), For. Mem. R.S. Œuvres. Tome I. 4to. *St. Pétersbourg* 1899.
From the Imperial Academy of Sciences, St. Petersburg.

Vukovic (A.) Erdbeben und Magnetnadel. (2 copies.) 8vo. *Wien* 1899. From Author per the Foreign Office.

Warington (R.), F.R.S. Lectures on some of the Physical Properties of Soil. 8vo. *Oxford* 1900. From the Author.

Whitehead (A. N.) A Treatise on Universal Algebra, with Applications. Vol. 1. 8vo. *Cambridge* 1898. Purchased.

Wilson (W. E.), F.R.S. Astronomical and Physical Researches made at Mr. Wilson's Observatory, Daramona, Westmeath. 4to. [1900.] From the Author.

Zenker (W.) Lehrbuch der Photochromie (Photographie der natürlichen Farben). Neu herausgegeben von B. Schwalbe. 8vo. *Braunschweig* 1900. From Prof. Dr. Schwalbe.

ACCESSIONS TO SERIALS.

American Mathematical Society. Transactions. Vol. I. No. 1. 8vo. *Lancaster, Pa.* 1900. From the Society.

Antwerp:—Pædologische Schooldienst. Pædologisch Jaarboek. Jaarg. 1. 8vo. *Antwerpen* 1900. From the Board.

Baltimore:—Maryland Weather Service. [Report.] Vol. I. 8vo. *Baltimore* 1899. From the Service.

Beiträge zur Geophysik. Herausgeg. v. Dr. G. Gerland. Band 1—4, &c. 8vo. *Leipzig* 1887–99. Purchased.

Bergen:—Museum. Bergens Museum 1825–1900. En Historisk Fremstilling af J. Brunchorst. 8vo. *Bergen* 1900. From the Museum.

Caracas:—Universidad Central de Venezuela. Anales. Tomo I. No. 2. 8vo. *Caracas* 1900. From the University.

Chicago:—Yerkes Observatory. Publications. Vol. I. A General Catalogue of 1290 Double Stars. By S. W. Burnham. 4to. *Chicago* 1900. From the Observatory

Groningen:—Astronomical Laboratory. Publications. Nos. 1—3. 4to. *Groningen* 1900. From the Laboratory.

Jassy:—Université. Annales Scientifiques. Tome I. Fasc. 1. 8vo. *Jassy* 1900. From the University.

Kansas:—University Geological Survey. Annual Bulletin on Mineral Resources of Kansas for 1898. 8vo. *Lawrence* 1899. From the University.

Liverpool:—Liverpool School of Tropical Diseases. Memoirs I and II. 8vo. *Liverpool* 1900. From Professor R. Boyce and the School.

Vienna:—K. K. Geographische Gesellschaft. Abhandlungen. Band I. Heft 1—5. 8vo. *Wien* 1899. From the Society.

PORTRAITS, MEDALS, &c., PRESENTED TO THE SOCIETY DURING 1900.

Portrait of Sir John Evans, K.C.B., F.R.S., by A. S. Cope, A.R.A. The Subscribers to the Evans Portrait Fund.

Portrait of Capt. George Manby, F.R.S., by Sir T. Lawrence, R.A. Bequeathed by Madame Barrot, of Paris.

Bronze Medal struck in Commemoration of the Jubilee of Sir G. G. Stokes, Bart., F.R.S., as Lucasian Professor of Mathematics in the University of Cambridge. The Registry of Cambridge University.

Bronze Medallion Portrait of the late Professor T. H. Huxley, and of Sir J. D. Hooker, F.R.S. Sir J. Evans, K.C.B., F.R.S.

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Institutions marked *p* are entitled to receive Proceedings only.

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Mexico.

p. Sociedad Científica "Antonio Alzate."

America (North). (See UNITED STATES and CANADA.)

America (South).

Buenos Ayres.

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Caracas.

B. University Library.

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AB. Academia Nacional de Ciencias.

Demerara.

p. Royal Agricultural and Commercial Society, British Guiana.

La Plata.

B. Museo de la Plata.

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Brisbane.

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p. Società Adriatica di Scienze Naturali.

Vienna.

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B. K.K. Naturhistorisches Hof-Museum.
B. K.K. Zoologisch-Botanische Gesellschaft.
p. Oesterreichische Gesellschaft für Meteorologie.
A. Von Kuffner'sche Sternwarte.

Belgium.

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AB. Académie Royale des Sciences.
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p. Observatoire Royal.
p. Société Belge de Géologie, de Paléontologie, et d'Hydrologie.
p. Société Malacologique de Belgique.

Ghent.

AB. Université.

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AB. Université.

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Halifax, N.S.

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Ottawa.

AB. Geological Survey of Canada.

AB. Royal Society of Canada.

St. John, N.B.

p. Natural History Society.

Toronto.

p. Toronto Astronomical Society.

p. Canadian Institute.

AB. University.

Windsor, N.S.

p. King's College Library.

Cape of Good Hope.

A. Observatory.

AB. South African Library.

Ceylon.

Colombo.

B. Museum.

China.

Shanghai.

p. China Branch of the Royal Asiatic Society.

Denmark.

Copenhagen.

AB. Kongelige Danske Videnskabernes Selskab.

Egypt.

Alexandria.

AB. Bibliothèque Municipale.

England and Wales.

Aberystwith.
AB. University College.

Bangor.
AB. University College of North Wales.

Birmingham.
AB. Central Free Library.
AB. Mason College.
p. Philosophical Society.

Bolton.
p. Public Library.

Bristol.
p. Merchant Venturers' School.
AB. University College.

Cambridge.
AB. Philosophical Society.
p. Union Society.

Cardiff.
AB. University College.

Cooper's Hill.
AB. Royal Indian Engineering College.

Dudley
p. Dudley and Midland Geological and Scientific Society.

Essex.
p. Essex Field Club.

Falmouth.
p. Royal Cornwall Polytechnic Society.

Greenwich.
A. Royal Observatory.

Kew.
B. Royal Gardens.

Leeds.
p. Philosophical Society.
AB. Yorkshire College.

Liverpool.
AB. Free Public Library.
p. Literary and Philosophical Society.
A. Observatory.
AB. University College.

London.
AB. Admiralty.
p. Anthropological Institute.
AB. Board of Trade: Electrical Standards Laboratory.
AB. British Museum (Nat. Hist.).
AB. Chemical Society.

England and Wales—*continued.*

A. City and Guilds of London Institute.
p. "Electrician," Editor of the.
B. Entomological Society.
AB. Geological Society
AB. Geological Survey of Great Britain.
p. Geologists' Association.
AB. Guildhall Library.
A. Institution of Civil Engineers.
p. Institution of Electrical Engineers.
A. Institution of Mechanical Engineers.
A. Institution of Naval Architects.
p. Iron and Steel Institute.
AB. King's College.
B. Linnean Society.
AB. London Institution.
p. London Library.
A. Mathematical Society.
p. Meteorological Office.
p. Odontological Society.
p. Pharmaceutical Society.
p. Physical Society.
p. Quekett Microscopical Club.
p. Royal Agricultural Society.
A. Royal Astronomical Society.
B. Royal College of Physicians.
B. Royal College of Surgeons.
p. Royal Engineers (for Libraries abroad, six copies).
AB. Royal Engineers. Head Quarters Library.
p. Royal Geographical Society.
p. Royal Horticultural Society.
p. Royal Institute of British Architects.
AB. Royal Institution of Great Britain.
B. Royal Medical and Chirurgical Society.
p. Royal Meteorological Society.
p. Royal Microscopical Society.
p. Royal Statistical Society.
AB. Royal United Service Institution.
AB. Society of Arts.
p. Society of Biblical Archæology.
p. Society of Chemical Industry (London Section).
p. Standard Weights and Measures Department.
AB. The Queen's Library.
AB. The War Office.
AB. University College.

England and Wales—*continued.*

p. Victoria Institute.
B. Zoological Society.

Manchester.
AB. Free Library.
AB. Literary and Philosophical Society.
p. Geological Society.
AB. Owens College.

Netley.
p. Royal Victoria Hospital.

Newcastle.
AB. Free Library.
p. North of England Institute of Mining and Mechanical Engineers.
p. Society of Chemical Industry (Newcastle Section).

Norwich.
p. Norfolk and Norwich Literary Institution.

Nottingham.
AB. Free Public Library.

Oxford.
p. Ashmolean Society.
AB. Radcliffe Library.
A. Radcliffe Observatory.

Penzance.
p. Geological Society of Cornwall.

Plymouth.
B. Marine Biological Association.
p. Plymouth Institution.

Richmond.
A. "Kew" Observatory.

Salford.
p. Royal Museum and Library.

Stonyhurst.
p. The College.

Swansea.
AB. Royal Institution.

Woolwich.
AB. Royal Artillery Library.

Finland.

Helsingfors.
p. Societas pro Fauna et Flora Fennica.
AB. Société des Sciences.

France.

Bordeaux.
- *p.* Académie des Sciences.
- *p.* Faculté des Sciences.
- *p.* Société de Médecine et de Chirurgie.
- *p.* Société des Sciences Physiques et Naturelles.

Caen.
- Société Linnéenne de Normandie.

Cherbourg.
- *p.* Société des Sciences Naturelles.

Dijon.
- *p.* Académie des Sciences.

Lille.
- *p.* Faculté des Sciences.

Lyons.
- AB. Académie des Sciences, Belles-Lettres et Arts.
- AB. Université.

Marseilles.
- AB. Faculté des Sciences.

Montpellier.
- AB. Académie des Sciences et Lettres.
- B. Faculté de Médecine.

Nantes.
- *p.* Société des Sciences Naturelles de l'Ouest de la France.

Paris.
- AB. Académie des Sciences de l'Institut.
- *p.* Association Française pour l'Avancement des Sciences.
- *p.* Bureau des Longitudes.
- A. Bureau International des Poids et Mesures.
- *p.* Commission des Annales des Ponts et Chaussées.
- *p.* Conservatoire des Arts et Métiers.
- *p.* Cosmos (M. L'ABBÉ VALETTE).
- AB. Dépôt de la Marine.
- AB. École des Mines.
- AB. École Normale Supérieure.
- AB. École Polytechnique.
- AB. Faculté des Sciences de la Sorbonne.
- B. Institut Pasteur.
- AB. Jardin des Plantes.
- *p.* L'Électricien.
- A. L'Observatoire.
- *p.* Revue Scientifique (Mons. H. DE VARIGNY).
- *p.* Société de Biologie.
- AB. Société d'Encouragement pour l'Industrie Nationale.
- AB. Société de Géographie.
- *p.* Société de Physique.

France—*continued.*

B. Société Entomologique.
AB. Société Géologique.
p. Société Mathématique.
p. Société Météorologique de France.

Toulouse.

AB. Académie des Sciences.
A. Faculté des Sciences.

Germany.

Berlin.

A. Deutsche Chemische Gesellschaft.
A. Die Sternwarte.
p. Gesellschaft für Erdkunde.
AB. Königliche Preussische Akademie der Wissenschaften.
A. Physikalische Gesellschaft.

Bonn.

AB. Universität.

Bremen.

p. Naturwissenschaftlicher Verein.

Breslau.

p. Schlesische Gesellschaft für Vaterländische Kultur.

Brunswick.

p. Verein für Naturwissenschaft.

Carlsruhe. See Karlsruhe.

Charlottenburg.

A. Physikalisch-Technische Reichsanstalt.

Danzig.

AB. Naturforschende Gesellschaft.

Dresden.

p. Verein für Erdkunde.

Emden.

p. Naturforschende Gesellschaft.

Erlangen.

AB. Physikalisch-Medicinische Societät.

Frankfurt-am-Main.

AB. Senckenbergische Naturforschende Gesellschaft.
p. Zoologische Gesellschaft.

Frankfurt-am-Oder.

p. Naturwissenschaftlicher Verein.

Freiburg-im-Breisgau.

AB. Universität.

Giessen.

AB. Grossherzogliche Universität.

Görlitz.

p. Naturforschende Gesellschaft.

Germany—*continued.*

Göttingen.
- AB. Königliche Gesellschaft der Wissenschaften.

Halle.
- AB. Kaiserliche Leopoldino-Carolinische Deutsche Akademie der Naturforscher.
- *p.* Naturwissenschaftlicher Verein für Sachsen und Thüringen.

Hamburg.
- *p.* Naturhistorisches Museum.
- AB. Naturwissenschaftlicher Verein.

Heidelberg.
- *p.* Naturhistorisch-Medizinischer Verein.
- AB. Universität.

Jena.
- AB. Medicinisch-Naturwissenschaftliche Gesellschaft.

Karlsruhe.
- A. Grossherzogliche Sternwarte.
- *p.* Technische Hochschule.

Kiel.
- *p.* Naturwissenschaftlicher Verein für Schleswig-Holstein.
- A. Astronomische Nachrichten.
- AB. Universität.

Königsberg.
- AB. Königliche Physikalisch-Ökonomische Gesellschaft.

Leipsic.
- *p.* Annalen der Physik und Chemie.
- AB. Königliche Sächsische Gesellschaft der Wissenschaften.

Magdeburg.
- *p.* Naturwissenschaftlicher Verein.

Marburg.
- AB. Universität.

Munich.
- AB. Königliche Bayerische Akademie der Wissenschaften.
- *p.* Zeitschrift für Biologie.

Münster.
- AB. Königliche Theologische und Philosophische Akademie.

Potsdam.
- A. Astrophysikalisches Observatorium.

Rostock.
- AB. Universität.

Strasburg.
- AB. Universität

Tübingen.
- AB. Universität.

Germany—*continued.*

Würzburg.

AB. Physikalisch-Medicinische Gesellschaft.

Greece.

Athens.

A. National Observatory.

Holland. (See NETHERLANDS.)

Hungary.

Buda-pest.

p. Königl. Ungarische Geologische Anstalt.

AB. Á Magyar Tudós Társaság. Die Ungarische Akademie der Wissenschaften.

Hermannstadt.

p. Siebenbürgischer Verein für die Naturwissenschaften.

Klausenburg.

AB. Az Erdélyi Muzeum. Das Siebenbürgische Museum.

Schemnitz.

p. K. Ungarische Berg- und Forst-Akademie.

India.

Bombay.

AB. Elphinstone College.

p. Royal Asiatic Society (Bombay Branch).

Calcutta.

AB. Asiatic Society of Bengal.

AB. Geological Museum.

p. Great Trigonometrical Survey of India.

AB. Indian Museum.

p. The Meteorological Reporter to the Government of India.

Madras.

B. Central Museum.

A. Observatory.

Roorkee.

p. Roorkee College.

Ireland.

Armagh.

A. Observatory.

Belfast.

AB. Queen's College.

Cork.

p. Philosophical Society.

AB. Queen's College.

Dublin.

A. Observatory.

AB. National Library of Ireland.

Ireland—*continued.*

B. Royal College of Surgeons in Ireland.
AB. Royal Dublin Society.
AB. Royal Irish Academy.

Galway.

AR. Queen's College.

Italy.

Acireale.

p. Accademia di Scienze, Lettere ed Arti.

Bologna.

AB. Accademia delle Scienze dell' Istituto.

Catania.

AB. Accademia Gioenia di Scienze Naturali.

Florence.

p. Biblioteca Nazionale Centrale.
AB. Museo Botanico.
p. Reale Istituto di Studi Superiori.

Genoa.

p. Società Ligustica di Scienze Naturali e Geografiche.

Milan.

AB. Reale Istituto Lombardo di Scienze, Lettere ed Arti.
AB. Società Italiana di Scienze Naturali.

Modena.

p. Le Stazioni Sperimentali Agrarie Italiane.

Naples.

p. Società di Naturalisti.
AB. Società Reale, Accademia delle Scienze.
B. Stazione Zoologica (Dr. DOHRN).

Padua.

p. University.

Palermo.

A. Circolo Matematico.
AB. Consiglio di Perfezionamento (Società di Scienze Naturali ed Economiche).
A. Reale Osservatorio.

Pisa.

p. Il Nuovo Cimento.
p. Società Toscana di Scienze Naturali.

Rome.

p. Accademia Pontificia de' Nuovi Lincei.
p. Rassegna delle Scienze Geologiche in Italia.
A. Reale Ufficio Centrale di Meteorologia e di Geodinamica, Collegio Romano.
AB. Reale Accademia dei Lincei.
p. R. Comitato Geologico d' Italia.

Italy—*continued.*

A. Specola Vaticana.
AB. Società Italiana delle Scienze.

Siena.
p. Reale Accademia dei Fisiocritici.

Turin.
p. Laboratorio di Fisiologia.
AB. Reale Accademia delle Scienze.

Venice.
p. Ateneo Veneto.
AB. Reale Istituto Veneto di Scienze, Lettere ed Arti.

Japan.

Tokiô.
AB. Imperial University.
p. Asiatic Society of Japan.

Java.

Buitenzorg.
p. Jardin Botanique.

Luxembourg.

Luxembourg.
p. Société des Sciences Naturelles.

Malta.

p. Public Library.

Mauritius.

p. Royal Society of Arts and Sciences.

Netherlands.

Amsterdam.
AB. Koninklijke Akademie van Wetenschappen.
p. K. Zoologisch Genootschap 'Natura Artis Magistra.'

Delft.
p. École Polytechnique.

Haarlem.
AB. Hollandsche Maatschappij der Wetenschappen.
p. Musée Teyler.

Leyden.
AB. University.

Rotterdam.
AB. Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte.

Utrecht.
AB. Provinciaal Genootschap van Kunsten en Wetenschappen.

New Zealand.

Wellington.
AB. New Zealand Institute.

Norway.

Bergen.
AB. Bergenske Museum.
Christiania.
AB. Kongelige Norske Frederiks Universitet.
Tromsoe.
p. Museum.
Trondhjem.
AB. Kongelige Norske Videnskabers Selskab.

Portugal.

Coimbra.
AB. Universidade.
Lisbon.
AB. Academia Real das Sciencias.
p. Secção dos Trabalhos Geologicos de Portugal.
Oporto.
p. Annaes de Sciencias Naturaes.

Russia.

Dorpat.
AB. Université.
Irkutsk.
p. Société Impériale Russe de Géographie (Section de la Sibérie Orientale).
Kazan.
AB. Imperatorsky Kazansky Universitet.
p. Société Physico-Mathématique.
Kharkoff.
p. Section Médicale de la Société des Sciences Expérimentales. Université de Kharkow.
Kieff.
p. Société des Naturalistes.
Kronstadt.
p. Compass Observatory.
Moscow.
AB. Le Musée Public.
B. Société Impériale des Naturalistes.
Odessa.
p. Société des Naturalistes de la Nouvelle-Russie.
Pulkowa.
A. Nikolai Haupt-Sternwarte.
St. Petersburg.
AB. Académie Impériale des Sciences.
B. Archives des Sciences Biologiques.
AB. Comité Géologique.

Russia—*continued.*

AB. Ministère de la Marine.
A. Observatoire Physique Central.

Scotland.

Aberdeen.
AB. University.
Edinburgh.
p. Geological Society.
p. Royal College of Physicians (Research Laboratory).
p. Royal Medical Society.
A. Royal Observatory.
p. Royal Physical Society.
p. Royal Scottish Society of Arts.
AB. Royal Society.
Glasgow.
AB. Mitchell Free Library.
p. Natural History Society.
p. Philosophical Society.

Servia.

Belgrade.
p. Académie Royale de Serbie.

Spain.

Cadiz.
A. Instituto y Observatorio de Marina de San Fernando.
Madrid.
p. Comisión del Mapa Geológico de Espãna.
AB. Real Academia de Ciencias.

Sweden.

Gottenburg.
AB. Kongl. Vetenskaps och Vitterhets Samhälle.
Lund.
AB. Universitet.
Stockholm.
A. Acta Mathematica.
AB. Kongliga Svenska Vetenskaps-Akademie.
AB. Sveriges Geologiska Undersökning.
Upsala.
AB. Universitet.

Switzerland.

Basel.
p. Naturforschende Gesellschaft.
Bern.
AB. Allg. Schweizerische Gesellschaft.
p. Naturforschende Gesellschaft.

Switzerland—*continued.*

Geneva.

AB. Société de Physique et d'Histoire Naturelle.

AB. Institut National Genevois.

Lausanne.

p. Société Vaudoise des Sciences Naturelles.

Neuchâtel.

p. Société des Sciences Naturelles.

Zürich.

AB. Das Schweizerische Polytechnikum.

p. Naturforschende Gesellschaft.

p. Sternwarte.

Tasmania.

Hobart.

p. Royal Society of Tasmania.

United States.

Albany.

AB. New York State Library.

Annapolis.

AB. Naval Academy.

Austin.

p. Texas Academy of Sciences.

Baltimore.

AB. Johns Hopkins University.

Berkeley.

p. University of California.

Boston.

AB. American Academy of Sciences.

B. Boston Society of Natural History.

A. Technological Institute.

Brooklyn.

AB. Brooklyn Library.

Cambridge.

AB. Harvard University.

B. Museum of Comparative Zoology

Chapel Hill (N.C).

p. Elisha Mitchell Scientific Society.

Charleston.

p. Elliott Society of Science and Art of South Carolina.

Chicago.

AB. Academy of Sciences.

p. Astrophysical Journal.

p. Field Columbian Museum.

p. Journal of Comparative Neurology.

Davenport (Iowa).

p. Academy of Natural Sciences.

United States—*continued.*

Ithaca (N.Y.).
- A. Journal of Physical Chemistry.
- *p.* Physical Review (Cornell University).

Lawrence.
- *p.* Kansas University.

Madison.
- *p.* Wisconsin Academy of Sciences.

Mount Hamilton (California).
- A. Lick Observatory.

New Haven (Conn.).
- AB. American Journal of Science.
- AB. Connecticut Academy of Arts and Sciences.

New York.
- *p* American Geographical Society.
- *p.* American Museum of Natural History.
- A. American Mathematical Society.
- AB. Columbia College Library.
- *p.* New York Academy of Sciences.
- *p.* New York Medical Journal.

Philadelphia.
- AB. Academy of Natural Sciences.
- AB. American Philosophical Society.
- *p.* Franklin Institute.
- *p.* Wagner Free Institute of Science.

Rochester (N.Y.).
- *p.* Academy of Science.

St. Louis.
- *p.* Academy of Science.

Salem (Mass.).
- *p.* American Association for the Advancement of Science.
- AB. Essex Institute.

San Francisco.
- AB. California Academy of Sciences.

Washington.
- AB. Patent Office.
- AB. Smithsonian Institution.
- AB. United States Coast Survey.
- B. United States Commission of Fish and Fisheries.
- AB. United States Geological Survey.
- AB. United States Naval Observatory.
- *p.* United States Department of Agriculture.
- A. United States Department of Agriculture (Weather Bureau).

West Point (N.Y.).
- AB. United States Military Academy.

CATALOGUE OF OBJECTS AND EXPERIMENTS EXHIBITED AT THE CONVERSAZIONE HELD IN THE SOCIETY'S APARTMENTS IN BURLINGTON HOUSE ON MAY 9, 1900.

1. *Exhibited by Mr. H. B. Hartley and Mr. H. L. Bowman, M.A.*

Demonstration of the properties of Crystals yielding doubly-refracting liquids on fusion.

Certain crystalline organic compounds, viz., *p*-Azoxyanisol, *p*-Azoxyphenetol, and Cholesteryl benzoate, have been found by Professor Lehmann, of Carlsruhe, to give on melting (at temperatures of 116°, 134°, and 145° respectively) liquids possessing the properties of double-refraction and dichroism, even under conditions in which a state of strain is impossible. When these anisotropic liquids are further heated, they change at definite temperatures of transition (134°, 165°, and 178° respectively) into ordinary isotropic liquids. The intermediate bodies have been called "liquid crystals," for, although the evidence of their elasticity, viscosity, and dielectric capacity shows them to be undoubtedly liquids, yet nevertheless they possess, like crystals, both double-refraction and dichroism.

2. *Exhibited by Mr. Richard Kerr, F.G.S.*

A Clock controlled at a distance by Wireless Telegraphy of the Hertzian Wave System.

A receiving instrument with a coherer is attached to the clock. A transmitting instrument in another part of the room gives rise to ethereal waves, which act upon the coherer and set the works of the clock in motion.

The experiment shows the possibility of directing the movements of torpedo boats, &c.

3. *Exhibited by Sir H. Howorth, K.C.I.E., M.P., F.R.S.*

Box with a painted interior.

A box, believed to be unique, painted by De Hooge Straten, whose name occurs on a letter inside it. It represents the interior of a Dutch house, in the style and manner of De Hooge. Its chief interest, apart from its character as a painting, is that it is an extraordinary *tour de force* in perspective—perhaps the most remarkable example of the application of the scientific principles of perspective extant.

4. *Exhibited by Professor J. W. Judd, C.B., F.R.S., on behalf of the Coral-Reef Committee of the Royal Society.*

Specimens from the Reefs of Funafuti.

(1.) Specimens illustrating the rate of growth of corals and calcareous algæ from the reefs of Funafuti.

Experiments made by Mr. A. E. Finckh, of Sydney, who in 1898 carried

the boring made by Professor T. E. David in the previous year from the depth of 698 feet to 1,114 feet, have thrown much new light upon this important question. Specimens illustrating these experiments are exhibited.

(2.) New and interesting forms of Foraminifera, which have been described by Mr. F. Chapman. These include:—

(*a.*) *Cycloclypens*, a genus prievously regarded as being very rare, but now shown to exist abundantly at Funafuti. The two species formerly described are now shown to be dimorphic forms of the same organism.

(*b.*) A curious form of *Polytrema*, which occurs encrusting various objects in alternate layers with the marine alga *Lithothamnion*, thus forming loose nodules.

(*c.*) The newly-described *Haddonia*, first obtained from Torres Straits &c.

(3.) Pinion of boring tackle, which, after being broken, was very ingeniously mended by the Sydney workmen, by the aid only of an ordinary blacksmith's forge. The wheel has been bound together with a piece of boiler-plate, and each tooth replaced by two bolts, which have been secured in position and filed to the proper shape. By this skilful work the expedition was saved from impending failure.

5. *Exhibited by Professor H. G. Seeley, F.R.S.*

Restorations of Dimorphodon.

These drawings, of the natural size, are based upon fossil remains from the Lias, in the British Museum. They represent the skeleton as in the quadruped and biped positions; and show the contours of the body at rest, walking, and preparing for flight, to illustrate proportions of the skeleton. The drawings have been made from working models with the wing membranes attached to the bones.

6. *Exhibited by Professor E. Ray Lankester, F.R.S., on behalf of the Archæological Survey of the Egypt Exploration Fund.*

Reproductions of Paintings and Sculptures in Tombs of Ancient Egypt, representing Domestic and Wild Animals and Birds.

The tombs of Ancient Egypt contain abundant representations of animal life. In spite of the artists' ignorance of perspective and occasional faulty colouring, the outlines are rendered with remarkable fidelity to nature, often enabling us to identify the species. Among domestic animals, the dogs are perhaps the most interesting, as showing that extreme development of various breeds had already taken place.

The monuments from which the drawings exhibited were copied are of two periods:—(1) Tombs at Beni Hasan, of the XIIth Dynasty (*circa* 2000 B.C.); (2) The Tomb of Ptah-hetep at Saqqareh, of the Vth Dynasty (*circa* 3000–2500 B.C.).

7. *Exhibited by Mr. W. W. Skeat.*

Ethnographical Objects from Malay Peninsula (Malay and Sakai).

(1.) (*a.*) Stages in the making of a Malay kris, showing one method of manu-

facturing a waved and damasked kris-blade, and photographs showing its composition; (*b.*) stages in the making of a kris-sheath, with specimens of the implements used; (*c.*) specimen "sarongs" from the east coast of the Malay Peninsula, showing difference between cloth of home-made and "trade" thread, and illustrating some local patterns.

(2.) (*a.*) Specimens of dress, implements, and ornaments of the Pangan tribe, a wild aboriginal tribe of Negrito stock; (*b.*) skull of adult male of this tribe; (*c.*) phonographic records of their songs.

8. *Exhibited by Dr. Downing, F.R.S.*

Maps illustrating the Total Eclipse of the Sun of May 28th, 1900.

(1.) General map of the eclipse, prepared by Señor Tarazona, and published by the Madrid Observatory.

(2.) Path of moon's shadow across Mexico, and

(3.) Path of moon's shadow across the United States, prepared by Professors Todd and Brown, and published in supplement to the American Ephemeris for 1900.

(4.) Path of moon's shadow across Portugal, Spain, and Algiers, prepared by Señor Tarazona, and published by the Madrid Observatory.

(5.) Stars and planets in the neighbourhood of the sun, prepared by Mr. A. C. Crommelin, and published by the British Astronomical Association.

9. *Exhibited by Mr. H. O. Arnold-Forster, M.P.*

Specimen Map from the London School Atlas.

An atlas for Elementary Schools, to be published by The London School Atlas Company, Limited. The atlas contains 48 pages of maps, and 8 pages of text.

10. *Exhibited by Mr. J. Wimshurst, F.R.S.*

An Influence Machine, constructed with twelve plates of Vulcanite.

It is suitable in size, in durability, and in efficiency for either screen or photographic work in the hospital or on the battlefield. The photographs for examination were taken by means of the diffused light which surrounds a tube when illuminated.

11. *Exhibited by Mr. Thomas Thorp.*

Grating Films (Celloidin) and their application to Diffraction Colour Photography (Wood).

Celloidin films of diffraction gratings, of about 14,500 lines to the inch, are impressed on chromated gelatine plates, the surface of which thus becomes grooved. Light falls on gelatine surface through photographic transparency. Celloidin film is detached, and plate immersed in warm water, when image appears in grooves more or less decided. Pictures are superposed and illuminated, and are then seen in their natural or other desired colours stereoscopically.

12. *Exhibited by Professor Minchin, F.R.S.*

Flashes induced in a Helium Tube by Hertz Waves.

13. *Exhibited by The Royal Geographical Society.*

Section cut from the tree on Lake Bangweulu, Central Africa, under which Livingstone's heart was buried, and containing the Inscription carved by his native followers.

14. *Exhibited by Dr. T. E. Thorpe, For. Sec. R.S.*

Examples of Leadless Glazed Ware.

(1.) Dessert set, tea set, Mayfair set, and ornaments, made and lent by the Worcester Royal Porcelain Co., Ltd.

(2.) Plates painted (*a.*) with underglaze, (*b.*) with overglaze colours; tiles painted with underglaze colours; two dishes with underglaze colours (*c.*) in lead, (*d.*) in leadless glaze; made and lent by Mintons, Ltd.

(3.) Centre-piece, cups, saucers and plate, and copper-red leadless glazed ornaments; made and lent by Bernard Moore, Longton.

(4.) Various plates; made and lent by Messrs. Burgess and Leigh, Barker and Read, Harrison and Son, John Maddock and Sons, Ltd.

(5.) Plates, teapot and cups and saucers, and ewer, lent by Messrs. Mortlocks, Ltd.

(6.) Plates, cups and mug, lent by Messrs. J. Defries and Sons, Ltd.

(7.) Sauce boat, plate and cream jug, lent by Messrs. F. and C. Osler.

(8.) Telegraph insulators, of Doulton's and Buller's make, lent by the Post Office.

15. *Exhibited by Mr. H. R. Holder.*

Photograph of the Statue of the late Professor Huxley, Pres. R.S., now in the Natural History Museum, South Kensington.

16. *Exhibited by Professor A. C. Haddon, F.R.S.*

The Decorative Art of the Sea Dayaks of Sarawak.

The carved and painted designs of the Dayak men are entirely different from the woven and embroidered patterns made by the women. The former are chiefly plant derivatives, while the latter are mainly greatly modified animal forms. The significance of the distinction and the real meaning of the patterns themselves is not yet elucidated.

The method by which the women make the patterns in their woven fabrics is also illustrated. The warp is stretched on a frame, and numerous strands are tied tightly with strips of leaves; the whole is removed and then submerged in a dye. The lashing is then undone, and the tied-up portions are found to be undyed. The whole process is repeated if a three-colour pattern is required.

17. *Exhibited by Professor Silvanus P. Thompson, D.Sc., F.R.S.*

Electromagnetic Experiments.

(*a*.) Converse of De La Rive's experiment, using floating magnet instead of floating battery.

(*b*.) New varieties of the De La Rive experiment.

18. *Exhibited by Mr. W. A. Shenstone, F.R.S., and Mr. H. G. Lacell.*

Apparatus constructed of Vitreous Silica.

A quantity of non-splintering silica, suitable for use in the oxygas flame, will be shown. The method of converting this into tubes and other forms of apparatus, as recently described in 'Nature,' May 3rd, 1900, will be demonstrated practically, together with experiments to illustrate the behaviour of vitreous silica under sudden and great changes of temperature.

The following apparatus, constructed of silica, will also be exhibited:—A long tube for use with a platinum thermometer; a mercury thermometer; bulbs and stems for thermometers; a Giessler tube; a small distilling tube; and rods and tubes of various sizes for various purposes.

19. *Exhibited by The Marine Biological Association.*

Marine Annelids and their Habits.

A collection of living marine worms (Annelids) from the neighbourhood of Plymouth, designed to illustrate, as far as possible, the prominent features in the habits of life of the different types of this class of animals, and such modifications of form as are related thereto. There are, for example, creeping, swimming, burrowing, and sedentary species; tube-builders, fixed and free; solitary and colonial types; rapacious and browsing forms; parasitic and commensal species; and species which proliferate by budding.

20. *Exhibited by Mr. Killingworth Hedges, M.Inst.C.E.*

(1.) Jointing Boxes and Aigrettes used in the rearrangement of the Lightning Conductors of St. Paul's Cathedral.

(2.) Old form of Joint, making an imperfect connection.

(3.) Drawings (fig. 1) showing faulty earth connection; also (figs. 2 and 3) of new earths. (Fig. 4) Plan of the new installation.

The original system for the protection of the Cathedral from lightning was installed under the advice of the Royal Society in about 1756. This was replaced in 1872 by what was then considered the most improved method, when the unsoldered joints were found to be very defective; in some cases they were quite loose; also the earths (Fig. 1), originally made by laying the cable in a drain which had become disused, were in some cases insulated from the ground. New earths (as Figs. 2 and 3) have been substituted. The method adopted to protect the structure unites the old system and the new cables to a horizontal conductor run on the top of the parapet, entirely round the building; to this copper aigrettes as shown are teed at intervals.

(4.) Photograph showing damage to Chapel at Thirsk.

The chapel at Thirsk was struck at 2.30 P.M. in the storm of April 16th last. The church, with tower 80 ft. high, about 180 yards away, was not touched. It will be seen that the lightning descended from the vane by the slates to the rain-water gutters, sideflashing downwards at each support, and in an upward direction at the water-pipe. All the thick glass windows were blown out outwards. There were no lightning conductors on either the church or the chapel.

21. *Exhibited by Dr. Isaac Roberts, F.R.S.*

A volume of photographs of Stars, Star-clusters, and Nebulæ.

The volume contains seventy-two photographs, which have been enlarged by mechanical processes from the original negatives, and they furnish evidence of the evolution of stellar systems from nebulous matter as seen in the convolutions of spiral nebulæ. They also furnish a foundation for the inference that the system of the *Milky Way* is not unlimited in extent, and that the numerous aggregations of stars, seen in lines and curves in the stellar regions, indicate their development from spiral nebulæ.

22. *Exhibited by Dr. C. I. Forsyth-Major, F.Z.S.*

Remains of extinct gigantic and lesser Lemurs from Madagascar, and living forms for comparison.

Restored model of skull (natural size) of giant lemur (*Megaladapis insignis*, Forsyth-Major) from cave deposits in S.E. Madagascar (described in 'Phil. Trans.,' April 5, 1900). Cast of skull of *Megaladapis madagascariensis*, Forsyth-Major (described in 'Phil. Trans.,' 1894), from marshes, S.W. Madagascar. Skull of the living *Lepidolemur microdon*, Forsyth-Major, placed for comparison with the fossil forms with which it most nearly agrees in its dentition.

23. *Exhibited by Dr. J. G. Garson.*

Anthropometric Instruments.

Instruments for the use of travellers desirous of making anthropometric observations on native races, or on the inhabitants of any special locality, whether at home or abroad.

Instruments and apparatus used in England for making metric observations on prisoners in connection with the identification of criminals by means of that system.

24. *Exhibited by Dr. Manson.*

Longitudinal Sections of Filariated Mosquitoes (*Culex ciliaris*), showing that *Filaria nocturna*, like the Malaria Parasite, leaves its mosquito host *viâ* the proboscis.

The insects were killed about three weeks after feeding on a girl in whose blood embryo filariæ abounded. In insects similarly fed and subsequently killed at serial intervals and sectioned, the passage of the filaria from the

stomach to the thoracic muscles and their development there could be followed readily. The sections under the microscopes show that when development is completed, in about sixteen days, the filaria quits the thorax and becomes lodged in the head of the insect below the cephalic ganglia, whence it passes into the proboscis. It does not enter by the salivary duct, as is the case with the malaria parasite, but breaks through the base of the proboscis, passing along the upper surface of the labium between this organ and the hypo-pharynx. It is to be presumed that when the mosquito next attacks man the filaria enters by the wound made by the stilette.

25. *Exhibited by Mr. A. P. Trotter, M.Inst.Elect.Eng.*

Models illustrating Leakage from Electric Tramways.

The equipotential lines (black) were found experimentally by Professor W. G. Adams' method. The lines of current flow (red) were inferred from the equipotential lines. The vertical scale represents potential, and the profiles of the vertical faces, potential gradients.

Model A represents the case of a tramway with a large number of cars uniformly spaced, the rails uninsulated, and of negligible conductivity; the whole current is assumed to return in a sheet through a thin stratum of earth to the tramway works.

Model B represents the case of a similar supply of current, but the extremity of the line is "boosted" down to the potential of the end near the works.

The edges meeting at points of maximum negative potential (two in model A, and three in model B) are axes of symmetry. The equipotential lines are distorted near edges which are not axes of symmetry, and become perpendicular to them. The maximum height of model B is half that of model A. The plane to which part of model B approximates represents zero potential. This plane is not recognisable in model A, but is that along which an equipotential line ultimately perpendicular to the tramway is directed.

26. *Exhibited by Dr. Arthur W. Rowe, F.G.S.*

Examples of Chalk Fossils.

(*a.*) Fossils from the chalk which have been developed from the matrix by means of the dental-engine. These fossils chiefly consist of Sponges and Bryozoa, forms which have been not a little neglected on account of the difficulty of extracting them from the matrix.

(*b.*) The series of *Micraster* used to illustrate the author's paper, "An Analysis of the Genus *Micraster*" ('Quart. Journ. Geol. Soc.,' vol. 55, August, 1899).

27. *Exhibited by the Cambridge Scientific Instrument Co., Ltd., Cambridge.*

Improved Forms of Standard Resistance Coils.

The coils are of bare wire wound on mica frames, and are immersed in oil of high insulating properties which can circulate freely in the vessel. The reading of a thermometer in the oil will give the temperature of the coil.

One of the coils, exhibited by the kind permission of the Board of Trade, is fitted with a platinum wire wound parallel to and on the same frame as the platinum-silver wire. These wires have very different temperature coefficients, and by measuring the resistance of both coils the temperature of the standard coil can be determined to a high degree of accuracy. These coils are annealed by heating them by a current when finished.

28. *Exhibited by Mr. P. E. Shaw.*

An Electric Micrometer.

Designed primarily to measure the small movements of a telephone diaphragm. A screw abuts on a system of three levers, set up on a strong wooden frame. By turning the screw, the far end of the levers moves to and fro through distances which can be controlled and measured. This end of the levers carries a rod, and the diaphragm a small plate, both of iridio-platinum; if these two surfaces touch one another, a flow of a small amount of electricity occurs, producing a sound in a telephone held by the observer; at the same time he reads by a telescope a graduated circular scale fixed on the screw. Since the screw and levers can be moved at will by the observer, he can, by this contact method, find the position of the diaphragm, and follow its movements. Precautions against vibrations are taken by having indiarubber suspensions, and against temperature changes by covering the working parts with boxes wrapped in felt.

Movements as small as $\frac{1}{200}$th of a wave-length of sodium light have been measured by this apparatus.

29. *Exhibited by Sir Andrew Noble, K.C.B., F.R.S.*

Modern Explosives: Illustrations and Results connected therewith.

In this exhibit will be shown a considerable variety of explosives, and the effect of some when exploded or detonated will be described and illustrated.

A few simple experiments will be shown, and the results of others exhibited with lantern slides.

The effect of erosion in guns will also be shown, as well as the results of experiments made with the object of minimising erosion.

30. *Exhibited by Dr. Arthur W. Rowe, F.G.S.*

The Photomicrography of Chalk Fossils by reflected light.

31. *Exhibited by Mr. F. Enock, F.L.S.*

Lantern Illustrations of Photographs from Living Insects, showing the Metamorphoses of one of the Odonata.

A series of photographs showing the metamorphoses of one individual nymph of *Æschna cyanea*, from the moment of quitting the water to that of the perfect imago.

ANNIVERSARY MEETING.

1900.

On Friday, November 30, being St. Andrew's Day, the Anniversary Meeting of the Society was held in their apartments in Burlington House.

The LORD LISTER, F.R.C.S., D.C.L., LL.D., President, in the Chair.

The Report of the Auditors was presented as follows:—

"During the past year, the total Ordinary Receipts on General Purposes Account, including the Treasury Grant of £1,000 for Publications, amount to £7,218 7*s.* 7*d.*

"The total Ordinary Expenditure for the same period on General Purposes, including grants for Publications, amounts to £7,012 8*s.* 7*d.*, showing an excess of Ordinary Income over Expenditure of £205 19*s.* 0*d.*

"The Assets of the Society on the General Purposes Account amount to £2,110 10*s.* 7*d.*, against which there are liabilities amounting to £1,407 2*s.* 4*d.*, leaving a balance to the credit of the Account of £703 8*s.* 3*d.*

"The total Receipts on account of Trust Funds, including balances from the preceding year, amount to £25,682 10*s.* 7*d.*, and the total Expenditure to £18,274 7*s.* 0*d.*, leaving a balance on account of Trust Funds of £7,408 3*s.* 7*d.*"

The thanks of the Society were voted to the Treasurer and Auditors.

The Secretary read the lists of Fellows elected and deceased since ast Anniversary.

The following Report of the Council, which had been previously distributed to the Fellows, having been taken as read, was, on the motion of the President, received:—

REPORT OF THE COUNCIL.

During the past year the time and attention of the Council have been largely occupied by business connected with matters of national and international scientific interest, in which H.M. Government has either directly sought the advice and assistance of the Society, or has itself given assistance and financial support to undertakings promoted by the Society in the interests of science.

National Physical Laboratory.

The operations of the National Physical Laboratory have been carried on in the buildings of the Kew Observatory. The control of the work carried on by the Kew Committee of the Royal Society was taken over by the Executive Committee from the 1st of January, and the property of that Committee was made over to the Royal Society as from that date.

The Committee, which was incorporated as a Public Company, has since been dissolved. The work at Kew Observatory has been continued in all its branches.

Various sub-committees have reported to the Executive Committee on the work which might be usefully undertaken by the Laboratory, and the Building Committee instructed to have regard to these reports in the preparation of the plans.

After considerable discussion, plans for a Physics building, at an estimated cost of £6,000, and an Engineering Laboratory, at an estimated cost of £4,000, were approved by the Executive Committee and submitted to the General Board.

Unfortunately all these plans must be discarded, and very grave loss of time has been caused by the unexpected opposition to the erection of the Laboratory in the Old Deer Park. H.M. Treasury have now informed the Council that Her Majesty is willing to assign the lease of Bushey House and the surrounding ground, 30 acres in extent, for the purposes of the National Physical Laboratory, and that the Government will increase the grant for building by £2,000 in order that the extensive alterations and repairs which will be necessary may be carried out.

Though the Council regret the decision of the Government not to erect the Laboratory in the Deer Park, they recognise with gratitude that Her Majesty has been graciously pleased to place at the disposal of the Society a site in which the work of the Laboratory can be carried on, and they have therefore accepted the offer made to them by H.M. Treasury. The work of preparing Bushey House for the Laboratory and of erecting

the new buildings which are necessary will be taken in hand at once.

The financial position is, for the present, satisfactory, but any savings which can be now effected will be needed for apparatus when the new buildings are ready for occupation. Towards the sum available for capital expenditure £5,000 has been paid to the Committee, and invested by them.

The Committee have to thank various donors for gifts. Sir Andrew Noble has contributed £1,000 for the purchase of apparatus. Dr. Isaac Roberts has given a spectroscope and two very valuable induction coils. Dr. Common has provided apparatus for determining the magnifying power and testing the collimation error of the telescopic sights, and has promised a large flat surface for optical work. Mrs. Sworn has given two thermometers (used by her late husband).

Disturbance of Magnetic Observatories by Electric Railways.

The Committee appointed by the Board of Trade to investigate this question has made experiments near Stockton and in London with instruments devised by Mr. W. Watson, Assistant-Professor of Physics in the Royal College of Science. No definite decision has, as yet, been arrived at by the Board of Trade, but the matter continues to be a subject of grave anxiety to those interested in the protection of observatories and laboratories from extraneous disturbances.

Steel Rails Committee.

The Departmental Committee appointed by the Board of Trade to consider the question of the deterioration of steel rails by prolonged use has presented its report. The Society was represented on the Committee by Sir W. Roberts-Austen and Prof. Kennedy.

National Antarctic Expedition.

Under the direction of the Joint Committee of the Society and the Royal Geographical Society preparations for the Expedition have been steadily pushed forward. Special Committees were appointed for dealing with the various questions involved in the organisation of the Expedition, which is so far advanced that the construction of the vessel (to be named the "Discovery") has been begun by a Dundee shipbuilding firm. The commander of the expedition, Commander R. F. Scott, R.N., the head of the Scientific Staff, Prof. Gregory, and three other officers have been appointed, and it is confidently hoped that the Expedition will be ready to start by August, 1901, when the German Antarctic Expedition is also expected to sail.

Funds have been raised exceeding £91,000, including the grant from H.M. Treasury of £45,000. This fund was raised in view of an Expedition lasting two years, but appeals are being made for more funds to enable the Expedition to remain in the

Antarctic for three years, for which the sum of £120,000 is required.

Malaria.

The three observers mentioned in last year's Report of the Council as pursuing their investigations in British Central Africa, under the direction of the Malaria Committee, have returned thence. Two have since been continuing their investigations on the West Coast of Africa. The results at which they have arrived, some of which are of great practical importance, have now been published in part, and a memorandum of the results attained, together with a note containing some practical suggestions for preventive measures, has been sent to the Colonial Office for circulation among the Colonies concerned. Further Reports will shortly be published, and, on the return of the observers in December, the plan of further operations will be carefully considered. Among other things, arrangements will probably be made for carrying out in suitable stations experimental measures with a view to the local extermination of the malaria-bearing mosquitoes.

Solar Eclipse.

The observations of the Eclipse of 1900, May 28, were, on the whole, accompanied by favourable weather. A special joint meeting of the Society and the Royal Astronomical Society was devoted to the reading and discussion of preliminary accounts of the observations, which will be published in the "Proceedings," and in the "Monthly Notices" of the Royal Astronomical Society.

The Lords Commissioners of the Admiralty, as on former occasions, have rendered most valuable assistance by conveying a party of the observers and their apparatus in one of H.M. ships from Gibraltar to Alicante, and in detailing officers and crew to assist in the observations. H.M. Secretary of State for Foreign Affairs also, at the request of the Council, procured important Customs and landing facilities for the observers in Algiers, Portugal, and Spain.

International Catalogue of Scientific Literature.

Considerable progress has been made towards the realization of the project for the publication of an International Catalogue of Scientific Literature.

The International Conference of 1900 decided that the Catalogue should be issued in 17 volumes, relating to 17 different sciences. At that Conference the representatives of six countries officially subscribed for 164 sets of volumes, and representatives of four other countries stated semi-officially that their Governments would probably take 30 sets.

The additional results which have since been attained are largely due to the action of a Fellow of the Society, who offered to guarantee the Society against loss if it would

subscribe for forty-five additional sets on certain conditions, the principal of which were (1) that the United States should subscribe for 45 sets, and (2) that if other countries than those whose representatives at the Conference either officially subscribed or made unofficial statements of their probable subscriptions undertook to take a certain number of sets, the supplementary subscription of the Royal Society should be reduced by that amount. The first of these conditions is now fulfilled; in fact, the United States have already subscribed for 65 complete sets or its equivalent, and further subscriptions may be expected. As regards the second condition, the number of additional sets for which the Royal Society is responsible has been reduced to 17 by the promise of subscriptions for 28 sets from countries the intentions of which were not declared at the Conference.

In view of the above facts, it has been decided to start the Catalogue on the 1st January, 1901, and necessary arrangements have been made to that end.

It has from the first been evident that the necessary contracts with a printer and a publisher—if a publisher should be employed—could not be made by an International Committee, and as the Central Bureau is to be established in London, the Council has decided that the Society should make these contracts in its own name. Before undertaking this responsibility they laid the facts of the case before Her Majesty's Government, by whom a guarantee of £1,000 a year for five years has been given, "to make good to the Royal Society a part of any loss which may be incurred by the publication of the proposed Catalogue." This guarantee was subject to certain conditions, which, in the opinion of the Treasury, have now been fulfilled. It is hoped that it will not be necessary to ask for the sum guaranteed, or, at most, for more than a small part of it.

The Council has also decided that the Royal Society shall itself be the publisher of the Catalogue, though a contract will be made by which most of the technical duties will be undertaken for the Society by a publisher who will be the Society's agent. It is believed that the chance of the success of the Catalogue will be much increased by this method of procedure. Foreign governments would prefer not to enter into direct relations with a publishing firm. Steps are being taken to organize the British Regional Bureau.

International Association of Academies.

The Council of the Association held its first meetings at Paris on July 31 and August 1, 1900, the Royal Society being represented by Prof. Rücker.

The Council considered and adopted various proposals made by several Academies as to the questions to be brought before the first meeting of the Association (to be held in 1901, probably at Easter), including a suggestion made on behalf of the Royal Society relative to the measuring of an arc of the meridian in Africa. Some simple regulations as to the conduct of the business of the Association were also approved.

The Council of the Royal Society has given notice of supporting certain amendments to the Statutes of the Association affecting the constitution of special committees, proposed by the National Academy of Sciences at Washington.

British Academy.

In connection with the Association of Academies, mentioned above, a most important matter has engaged the attention of the Council.

At the meeting of the Association held in October, 1899, and referred to in the last Report, it was understood that no Society devoted to one subject or to a small range of subjects would be regarded as an "Academy," and that an Academy might be admitted either to the Literary Section alone, or to the Scientific Section alone, but not to both, unless its constitution showed that the sphere of its labours embraced both literary and scientific subjects.

So far as the Council is aware, there is no Society in existence in England dealing with subjects embraced by the Literary Section in such a manner as to satisfy the first of these conditions. Hence, as matters at present stand, the Royal Society being regarded as a Scientific Society only, the United Kingdom can only be represented on the Scientific Section of the Association.

The Council put themselves in communication with some distinguished men of Letters with regard to the formation of a Literary Academy, such as would satisfy the requirements of the Association. These gentlemen were of the opinion that it would not be desirable to attempt to form such an Academy by the simple federation of existing Societies dealing with the matters in question. Subsequently a number of them submitted to the Royal Society a memorandum in which it was suggested that the Society might give its aid towards the desired result in one of two ways:—it might propose to enlarge its scope and include a section corresponding to the "Philosophico-Historical" and "Philological" division of the German Royal Academies and Societies; or it might address a memorial to the Government, pointing out the exceptional position in which England is placed as compared with other European countries through the absence of any Academy representing departments of study other than Mathematics and Natural Science, and advocating the formation of such an Academy.

A Committee of Fellows of the Society was appointed to consider the above memorandum, with power to confer with such persons as they thought desirable, and to report to the Council on the suggestions made in the memorandum, stating the various reasons which might be urged for and against them, but not advocating any distinct policy. The Committee has devoted much time and trouble to the matter, and has furnished a Report of some considerable length which discusses the powers of the Society to deal with the subjects in question, and various ways in which this might be done. As instructed by the Council, it has confined itself to stating the reasons which

may be urged for and against the several measures suggested. The present Council had no opportunity of discussing this Report until its last sitting; it then agreed to leave the Report, without recording any opinion, to the succeeding Council.

"Privileged" Candidates for Fellowship.

Further consideration of the statutes governing the election of Fellows under privileged conditions has been deferred until after a decision has been arrived at concerning the establishment of a British Academy, referred to above.

Mackinnon Bequest.

The administration of the testator's estate having now been completed, and the Trust Fund transferred to the Society, less the proceeds of certain small investments which are still awaiting sale, and an amount temporarily retained by the executors for the provision of certain annuities, the Council have had under consideration the best means of administering the income available. This question was referred to a Committee to consider, and on their report it has been decided that the award shall be in the nature of a Studentship for the encouragement of research rather than a prize for the reward of past achievement, and that the Studentship (which at present amounts to about £150 per annum) should be devoted to the maintenance of a student engaged in research. The conditions of award will be published in future editions of the Year Book.

Hughes Bequest.

Under the will of the late Professor Hughes, a bequest of £4,000 has been made to the Royal Society with a direction to award the income annually as a prize either in money or in the form of a medal, or partly one and partly the other, for the reward of original discovery in the physical sciences, particularly electricity and magnetism, or their applications, the prize or medal to be given under conditions to be fixed from time to time by the Society on lines similar to those followed in the bestowal of the Copley, Rumford, and Royal medals.

After full consideration it has been decided to award annually a gold medal to be called the "Hughes Medal," not exceeding in value the sum of £20, together with the balance of the income of the fund to such person as the President and Council may consider the most worthy recipient, without restriction of sex or nationality, as the reward of original discovery in the physical sciences, particularly electricity and magnetism, or their applications, such discovery or applications having been published not less than one year before the award.

Terms of Bequests.

A memorandum relating to the terms of bequests to the Society will be printed in the new issue of the Year Book.

The object of this memorandum is to make it generally known that, while the Society is willing to receive gifts to be applied to special objects or for the benefit of particular sciences indicated by the donors, nevertheless, in view of the varying necessities of science, the most useful benefactions are those which are given to the Society in general terms for the advancement of natural knowledge.

The Council have been led by experience to the conclusion that it is neither to the advantage of the Society, nor in the interests of Science, that the already long list of medals awarded by the Royal Society should be added to, and consider, therefore, that no further bequests to be awarded as prizes for past achievements should be accepted by the Society.

They desire, however, to make known that the funds belonging absolutely to the Society are very few indeed, and they have again and again had the experience that the usefulness of the Society for the advancement of Natural Knowledge has been greatly hampered by the lack of funds of which they could freely make use according to their own judgment.

The Apartments of the Society.

On several occasions the attention of the Council has been drawn to the inadequacy of the present rooms of the Society, as regards both wall space for the library and accommodation for the meetings of Committees. On these grounds, Her Majesty's Government was approached with the view of ascertaining whether the Society could be housed in the premises in Burlington Gardens recently vacated by the University of London. The Government, however, have decided to retain the building for their own purposes, and no further action has therefore been taken by the Council in the matter.

The Council, however, are of opinion that the inadequacy of the accommodation is so great as most seriously to interfere with the proper activity of the Society, and that some measures ought to be taken to remedy what is becoming a serious hindrance to its work.

Electric Lighting.

In consequence of an intimation received from Her Majesty's Office of Works, that the system of Electric Lighting was not considered satisfactory by that Department, the Council have, on the recommendation of the House Committee, sanctioned the execution of extensive alterations, in order to bring the installation up to the standard of modern requirements. They have also, on the recommendation of the Committee, arranged for the permanent supply of alternating current to the building, and for the extension of the direct current main leads; an arrangement which will, it is hoped, prove both convenient and economical on the occasions of the Society's Soirées.

The Council desire here to record their sense of the great obligation they are under to Prof. Ayrton for placing his pro-

fessional skill, and much of his valuable time, at the service of the Society in this matter.

Library.

During the past year eight new serial publications have been added to the 466 which the Royal Society already received at regular intervals by exchange or purchase. Besides these, 58 books have been added to the Library by presentation or purchase. Among the additions may be specially mentioned:—Lord Rayleigh's "Scientific Papers," Vol. 1; John Couch Adams' "Scientific Papers," Vol. 2; Sir William and Lady Huggins' "Atlas of Representative Stellar Spectra"; "Nansen's Polar Expedition, Scientific Results," Vol. 1; "The Scientific Memoirs of Thomas Henry Huxley," Vol. 2; Mr. E. Wilson: "Astronomical and Physical Researches at Daramona"; "Geschichte der K. Preussischen Akademie der Wissenschaften"; "Paris Société de Biologie," Volume Jubilaire; "Illustrations of the Botany of Captain Cook's Voyage in the *Endeavour*."

Publications.

During the past year 21 papers have been published in the Mathematical and Physical section, and 11 in the Biological section of the "Philosophical Transactions." The two sections together contain, in all, 1,320 pages of letterpress and 20 plates. Eighteen numbers of the "Proceedings" have been issued, containing 646 pages and 8 plates.

In all, 111 papers were received between the close of the Session in June, 1899, and the corresponding date in 1900. Of these, 48 were submitted for publication in the "Philosophical Transactions," and 63 for the "Proceedings"; and 36 and 39 have been ordered for publication in the two categories respectively.

Publication Fund.

Out of the Grant of £1,000 annually placed in the Society's hands by Her Majesty's Government "to assist not merely their own publications, but also the adequate publication of scientific matter through other channels and in other ways," the sum of £511 13*s.* 4*d.* has this year been voted to societies and agencies other than the Royal Society. Of the total sum of £5,000 received by the Society in respect of this Grant since its initiation, the sum of £2,231 8*s.* 4*d.* has been so applied.

Catalogue of Scientific Papers.

Progress continues to be made with the "Catalogue of Scientific Papers" and with the classified Index thereto.

As regards the supplementary portion of the Catalogue, the transcription of the copy was completed in the course of 1898, and 45 sheets have now been passed for printing.

The Committee intend to have the whole of the work completed by the end of July, 1901.

Of the classified Index to the Catalogue about 334,500 slips have been prepared. During the past year 10,500 slips have been prepared.

The provisional classification of the prepared slips has been continued, and about 234,000 more slips, bringing the total up to 334,500, have been classified. About 16,000 of these have been finally revised for printing during the past year.

Government Grant.

Under the regulations for the administration of the Government Grant, the Council has, upon the recommendation of the Government Grant Committee, made grants amounting to £3,733, including a grant of £500 to the Joint Permanent Eclipse Committee, and £333 6*s.* 8*d.*, a third of a promised grant of £1,000, to the Joint Antarctic Committee. A portion of the grant has, in accordance with the regulations, been placed at the disposal of the President and Council of the Royal Society, to meet any pressing demands upon the Fund which may be made before the next annual meeting of the Government Grant Committee. The funds did not admit of any sum being carried forward to the Reserve Fund Account.

General Business.

At the invitation of the Royal Academy of Sciences at Berlin, delegates were appointed to attend the celebration of the 200th anniversary of the Academy, held in March. The Foreign Secretary and Prof. Ramsay attended, and an appropriate address, which had been drawn up by the Council, was presented.

The Council have decided that obituaries of deceased Fellows, in addition to appearing in the Year Book, shall be issued, either yearly or at such other intervals as may seem desirable, in a volume uniform with the Proceedings.

A new edition of "The Record of the Royal Society" is in preparation, and will be published early in the new year. Chronological and alphabetical lists of Fellows elected since the foundation of the Society will appear for the first time in this edition.

Although it is intended that a new edition of the "Record" shall appear only once in five years, the beginning of the new century was felt by the Council to be a suitable occasion for the issue of a revised edition of the work.

Representations having been made to the Council, by the Royal Statistical Society, of the desirability of taking an Intermediate Census of a simple and comparatively inexpensive character in the year 1906, Lord Salisbury and Mr. Balfour have been approached on the subject, and the matter is now under the consideration of the Local Government Board.

The Council have had pleasure in accepting, on behalf of the Society, a portrait in oils of their late Treasurer, Sir John Evans, subscribed for by a number of Fellows. The portrait is painted by Mr. A. S. Cope, A.R.A., and will, in due course of time, be hung upon the Society's walls.

The Presidency.

Lord Lister, who has held the Office of President for five years, having expressed his wish not to be put in nomination again, the Council unanimously resolved to invite Sir William Huggins to allow himself to be nominated to the Office, and are glad to be able to report that he has accepted the invitation.

It would be superfluous for the Council to enlarge upon the assiduity and success with which Lord Lister has discharged the onerous duties of his Office, to the great advantage of the Society; but they have great pleasure in announcing that he has consented to have his name included in the list of those submitted to the Society for election into the Council for the coming year.

The President then addressed the Society as follows:—

Since the last Anniversary, death has deprived us of fifteen Fellows and two Foreign Members.

The deceased Fellows are:—

H.R.H. The Duke of Saxe-Coburg and Gotha, died July 30, 1900, aged 56.

Sir Richard Thorne Thorne, died December 18, 1899, aged 58.

Sir James Paget, died December 30, 1899, aged 85.

David Edward Hughes, died January 22, 1900, aged 69.

John James Walker, died February 15, 1900, aged 75.

Dr. William Marcet, died March 4, 1900, aged 72.

Professor Thomas Preston, died March 7, 1900, aged 39.

Edward Joseph Lowe, died March 10, 1900, aged 75.

George James Symons, died March 10, 1900, aged 62.

Professor St. George Mivart, died April 1, 1900, aged 72.

George Douglas Campbell, Duke of Argyll, died April 24, 1900, aged 76.

Lieut.-General Augustus Henry Lane-Fox Pitt-Rivers, died May 4, 1900, aged 73.

Dr. John Anderson, died August 15, 1900, aged 66.

Sir John Bennet Lawes, died August 31, 1900, aged 85.

Sir Henry Wentworth Dyke Acland, died October 15, aged 85.

The Foreign Members are:—

Joseph Louis François Bertrand, died April 3, 1900, aged 77.

Willy Kühne, died June 10, 1900, aged 63.

Of these, some made such conspicuous additions to Natural Knowledge, that brief notices of them seem called for on the present occasion.

In James Paget the medical profession lost one of the brightest ornaments it ever possessed. His career was in many ways very remarkable. His father, long a prosperous Yarmouth merchant, having fallen into embarrassed circumstances, and with a large family to support, was unable to do more for young Paget's education than to send him to a private school in his native town. This disadvantage, however, was afterwards to a large extent compensated both in mathematics and in languages by his own unaided study. At the age of 16 he was apprenticed to a busy general practitioner in Yarmouth. While discharging the routine duties of that position, he devoted his leisure hours to natural history and professional reading; and in his case the apprenticeship system seems to have worked wonderfully well. For having proceeded at the age of 21 to St. Bartholomew's Hospital, he studied with such effect, that at the conclusion of his first year he took first prizes not only in such elementary subjects as Botany and Chemistry, but also in Surgery and Medicine. At the end of another year he became a Member of the College of Surgeons; and so ended his studentship at St. Bartholomew's, his straitened means having precluded him from holding a Dressership.

On his return to Yarmouth, the question of his entering into partnership with a general practitioner presented itself; but he felt within him a desire for higher things, and he determined to seek his fortune in London. Here he maintained a scanty subsistence by private teaching and literary work; and he also derived a small pittance from the curatorship of the museum at St. Bartholomew's. This appointment, however, gave him the opportunity for studying and teaching Pathology, the subject in which he became pre-eminently distinguished. His splendid powers of lucid exposition soon led to his being made, at the request of the students, lecturer on Pathology at the school, and somewhat later to his election to a Professorship at the College of Surgeons, where he had been entrusted by the Council with the preparation of a descriptive Catalogue of the Pathological Department of the Hunterian Collection, a Herculean task, which he executed to universal admiration. It was at this period that he delivered his great "Lectures on Surgical Pathology," the publication of which was a priceless boon to the profession, to which I venture to express my own deep indebtedness.

At the age of 33 he was appointed Assistant-Surgeon to St. Bartholomew's; but he had to wait fourteen years longer before an opening occurred for him to be made full surgeon. He was not less distinguished as a clinical teacher than as a pathologist. But it was the scientific side of surgery that had the greatest charm for him; and it

was as an accurate observer and wise collator of the pathological facts met with in his practice that his chief strength lay. And if we consider that he never had the advantage of a Dressership or House-Surgeoncy, that he only became a full surgeon at the age of 47, and only held that office for ten years, it may well seem astonishing that he should have occupied for a long period the very foremost place as a consulting surgeon in England. So great was the confidence of the profession in his vast knowledge and clinical wisdom. It was a remarkable example of the triumph of intellect and science over very formidable obstacles.

At the same time his lofty conception of professional dignity and duty, his rare unselfishness and personal charm, aided by his great, though unostentatious, eloquence, not only secured the affectionate admiration of his professional brethren, but gave him a general elevating influence, perhaps unrivalled in a surgeon.

To the nature of the principle that guided and sustained him throughout his noble life, this is perhaps not a fitting occasion to refer. For two years before his death at the ripe age of 85, he was rendered very helpless by increasing infirmity, though retaining to the last his interest in his profession and in the world at large. He is said never to have uttered a complaining word.

He was elected a Fellow of this Society in 1851, and took a deep interest in its affairs, serving in all eight years upon the Council. He early acquired the confidence of his Sovereign, being made Surgeon Extraordinary to Her Majesty in 1858, at the age of 44; and in 1877 he became Sergeant-Surgeon. He was created a baronet in 1871. I should weary you were I to enumerate all the positions of trust and dignity that he occupied, or the many honours that he received from universities and scientific societies at home and abroad.

David Edward Hughes, born in London in 1831, of Welsh parents, was taken by them to the United States in very early life. He was a musical genius, and when he was only 19 he was appointed Professor of Music at Bardstown College, Kentucky. Having developed a great taste for science and mechanics he was given also the chair of Natural Philosophy. In 1854 he invented his Roman type-printing telegraph, which brought him fame and laid the foundation of his wealth. It became and remains the international form of all telegraphs communicating between European nations. In 1855 he returned to this country, but he remained to the last an American citizen.

Professor Hughes loved science and he was instinctively a scientific thinker and naturally an experimenter. His manipulative skill, and the ease with which he made simple things such as pill-boxes, bonnet wire, common nails, and sealing wax perform the part of the most expensive laboratory apparatus was the striking feature of his scientific work and practical illustrations before the Royal Society.

The microphone, the neutralisation of inductive disturbances in neighbouring wires, the induction balance, the sonometer, and his researches in magnetism and inductance formed the subject of papers which cannot easily be forgotten by those who were present in this room when he illustrated them to the Society. He was elected a Fellow in 1880, and received a Royal Medal in 1885. He was a man of simple personal tastes; and, spending little upon himself, he amassed nearly half a million of money. Of this he left four-fifths to London hospitals; but bequeathed £4000 to this Society for the promotion of those sciences in which he had worked with such remarkable success.

In Sir John Bennet Lawes we have lost a man of keen perceptions and of indomitable perseverance, a thoughtful student of economic questions, and one who when occasion arose could exhibit unbounded liberality. Left an orphan at an early age, on assuming the control of the estate in Hertfordshire left him by his father, he fully realised the important relations that existed between chemical science and agriculture, and in 1834 began that series of experiments which gradually led to the establishment of his high scientific renown.

In 1843 he called to his aid another of our Fellows, Dr., now Sir Henry, Gilbert; and many of the results of their experiments in the field, the feeding-shed, and the laboratory have been communicated to this Society and published in the 'Philosophical Transactions.' In 1867, a Royal Medal was awarded to Messrs. Lawes and Gilbert conjointly, and they were also the joint recipients of the Albert Medal of the Society of Arts in 1893. In 1882 his services to agriculture were recognised by a baronetcy being granted to him by the Crown.

It would be out of place here to enter into the details of the well-known Rothamsted experiments, which have now been carried on for upwards of fifty-seven years, and the jubilee of which was publicly celebrated in 1893. I must, however, say a few words with regard to the Trust founded by Sir John Lawes in 1889, for carrying on and extending the scope of those experiments; which he endowed with the munificent sum of £100,000. The conduct of the Trust is committed to a body of nine persons, of whom four are appointed by this Society, two by the Royal Agricultural Society, one by the Linnean, and one by the Chemical Society, the ninth being the owner for the time being in possession of the mansion at Rothamsted.

It will be seen from this arrangement how great was the confidence of Sir John Lawes in the Royal Society, and how deeply we are bound to honour his memory. I trust that that confidence may be fully justified, and that our representatives may long continue to carry on the experiments which he originated, and may even extend their scope, in such a manner that scientific knowledge may be made efficiently to conduce to the welfare of the most important industry of this country.

After a life of scientific activity that extended over more than sixty

years, the illustrious mathematician Bertrand died at the age of 78. He had been a member of the Academy of Sciences since 1856, and during the last twenty-six years was one of its two permanent secretaries. The salutary influence and stimulus he exercised in that high office were recognised in the discourses pronounced in Paris on the occasion of his death last April.

His genius showed itself in early years; his first paper being published in 1839, when he was a boy of 17. The steady course of his productions from that youthful beginning is shown in the long list of his original papers in our Catalogue. He made important contributions to theoretical mechanics and the theory of differential equations; and the expositions given in his books on electricity, on thermodynamics, and particularly on the theory of probability, are valuable on account of the critical faculty by which they are dominated. He probably will remain best known by his treatise on the differential calculus and the integral calculus, of which two volumes were published; a third volume was written, but unfortunately the manuscript was burnt during the Paris troubles of 1870–1, and Bertrand never rewrote it. This treatise has proved of the greatest assistance to students of the subject: it is an acknowledged classic.

Not a little of the fascination of his books is due to the excellence of the presentation: his style gives an added attractiveness to the mathematics. Outside his mathematics, he was a writer of high distinction; long ago he was elected a member of the Académie Française. He is a loss both to science and to literature, and we, in expressing our regret at the death of one who had been a foreign member of our body for a quarter of a century, can sympathise with France on the death of her illustrious son.

Willy Kühne was born at Hamburg in 1837, as the son of a well-to-do merchant. After receiving his early education at the Gymnasium of Lüneburg, he entered the University of Göttingen in 1854. Here he at once commenced the study of natural sciences and medicine, working at chemistry in Wöhler's laboratory and studying physiology under Rudolph Wagner. Here he first met, as fellow-student, Carl Voit, from whom we learn that even at this early period Kühne impressed all those who came in contact with him with the firm impression that he would "go far" in the future. After taking his degree as Doctor of Philosophy at Göttingen in 1856, he studied one semester in Jena, and then moved on to Berlin, where he spent upwards of a year, at work in the laboratory of Du Bois-Reymond, under whom he began that series of researches on the physiology of muscle and nerve with which his name is indelibly connected. The next three years were passed in Paris, where he continued his work on muscle and nerve in the laboratory of Claude Bernard. This was in all ways one of the most fruitful periods of his life, and one of

which he always spoke with enthusiasm, and with reverence for the great master, whom he loved to the last. Up to the beginning of 1860 Kühne had published no less than eight elaborate and important papers on the physiology of muscle and nerve. These were followed by other ten, extending to 1865 and practically concluding his contributions to this branch of physiology. Two of his papers at this period are monographs which are quite classics, namely, one published in 1862 on "The Peripheral End-organs of Motor Nerves," and the other the celebrated "Researches on Protoplasm and Contractility" in 1864. The larger part of 1863 was spent by Kühne in Vienna with Brücke and Ludwig, and in the same year he was called to Berlin to manage the chemical department of the Pathological Laboratory under Virchow. The five years thus passed in Berlin saw the initiation of the more purely chemical work on digestion, to which he subsequently devoted so much time and attention. During this period also he published his well-known "Text-book of Physiological Chemistry," a work remarkable for the way in which it brought compactly together the essentials of the subject, for clearness of exposition, and above all for suggestiveness in the treatment of the facts and problems with which it dealt.

In 1868 he was appointed Professor of Physiology in the University of Amsterdam, where he remained until 1871, when he was called to the chair of physiology at Heidelberg, in succession to Helmholtz. At this period, and for several subsequent years, Kühne produced but little in the way of original work; partly no doubt in consequence of the labour of superintending the erection of a new physiological institute in Heidelberg, in which he lived and worked in complete happiness until his death on June 10 of the current year.

In 1876 he was once more in the full swing of chemical research when, in November, Boll's work appeared announcing the existence in the retina of a very unstable coloured substance, since known as visual purple. Kühne saw at once the great possibilities as to a photo-chemical theory of vision which this discovery involved, and threw himself with astounding impetuosity into the investigation of the new substance. His work was largely exhaustive of the subject, and appeared in some twenty papers in the four volumes of his 'Untersuchungen aus dem physiologischen Institute zu Heidelberg,' which he published from 1877 to 1882. Kühne's hopes that visual purple would prove to be a basis for a complete physiological theory of vision were upset by the observation that it is absent from the fovea, the retinal region of most distinct vision; but his belief in 1878, that visual purple is primarily concerned with vision in light of low intensity has been generally accepted and confirmed by all the more recent and reliable work of other physiologists.

In 1883 Kühne became co-editor with his former student-friend

Carl Voit of the 'Zeitschrift für Biologie,' and published his subsequent work in that journal. With the exception of an occasional, but always important, return to the subjects of his earliest researches (muscle, nerve, and protoplasm), Kühne henceforward devoted himself to an exhaustive study of the digestion products obtainable from proteids. The full value of his work in this branch of physiology will, without doubt, become much more conspicuously obvious when some sure insight into the chemical constitution of proteids has been attained.

Kühne delivered the Croonian Lecture in 1888, on the "Origin and Causation of Vital Movement," and was elected a foreign member of the Royal Society in 1892.

The business of the Society during the past year has been fully dealt with in the Council's Report. I may add that on the occasion of the death of His Royal Highness the Duke of Saxe-Cobourg and Gotha, the Council not being in session, I took upon myself to send to Her Majesty on behalf of the Fellows a letter of respectful condolence. The Home Secretary, through whom it was transmitted, informed me that it met with a very gracious reception.

Through the Malaria Committee the Society has kept in touch with the progress that has been made in unravelling the mystery of the greatest scourge of our tropical colonies, and with the steps that advancing knowledge has suggested for its suppression. The subject has now reached a stage at which it may be not unfitting to refer briefly to what has been accomplished.

The term "malaria" implied the belief that some vitiated state of the atmosphere was the cause of the disease. But the knowledge gained of late years of the parasitic nature of infective disorders pointed clearly to such an origin of the intermittent fevers, as the various manifestations of malaria have been termed. Accordingly diligent and long-continued search was made in the water and the soil of malarious districts in Italy for the suspected living agent, but without success. The discovery was made in 1880 by Laveran, a French army surgeon stationed in Algiers, who observed in the red blood corpuscles of malarious patients what he regarded as adventitious living organisms; not of vegetable nature like the bacteria which constitute the *materies morbi* of so many infective diseases, but a very low form of animal life. In what he believed to be the youngest condition of the organisms, they appeared in the red blood-discs as tiny specks of colourless protoplasm, possessing amœboid movements. These growing at the expense of the red corpuscles which they inhabited, consumed them more or less completely, at the same time depositing in their own substance a peculiar form of dark brown or black pigment, such as had long been known to form characteristic deposits in the organs of malarious subjects. As they grew they assumed various forms, among

which was what Laveran termed the "rosace," a rounded body bearing at its circumference little spherules, while the pigment was accumulated at the centre.*

This discovery of Laveran's, at first regarded with the gravest suspicion by pathologists, was the first great step in the etiology of malaria. It supplied the means of distinguishing the disease from its counterfeits, and it explained the wonderful specific efficacy of quinine, till then given only empirically. Quinine is remarkable in the circumstance that it acts with deadly effect upon some microbes, in dilutions which are quite unirritating to the human tissues. It can thus be given in sufficient doses to kill the malaria parasite in the blood without injuring the patient.

Nine years after Laveran's discovery, Golgi, of Pavia, who had been specially studying the "rosace" form of the parasite, and who had become convinced that the spherules at the circumference of the rosace were sporules of the microbe, announced that he had observed differences between the rosaces of the tertian and quartan forms of the fever, so great and so constant as to make him satisfied that they were two distinct species of organism. At the same time he had made the extremely important observation that the periods of occurrence of the fever corresponded with the times of maturation of the rosaces. These all coming to maturity about the same time, shed their sporules into the blood, and this determined the febrile attack. The free sporules then, according to his view, attached themselves severally to other red discs, constituting Laveran's tiny amœbæ, and grew in the red corpuscles without causing symptoms till they had produced a fresh crop of sporules ripe for extrusion, the time for this being two days in the tertian and three days in the quartan form. Thus the periodicity of the intermittent fevers and their variety in that respect were alike explained.†

A few months later a third species of the parasite was recognised, having the peculiarity that some of its individuals, instead of being of rounded form, were of crescentic shape. This species received the title æstivo-autumnal, on account of the season in which it showed itself in Italy. It was not so regular in its periods as the others, and was much more dangerous. The existence of these different species was at first very generally doubted, but it is now universally accepted and is of very great importance. The examination of a drop of blood from the finger of the patient enables the physician to decide not only whether the disease is malaria, but which of the three types it will follow. The more dangerous crescent form is commonest in the tropics, and hence has been termed by Koch tropical malaria. The quartan has proved the mildest of the three.

* *Vide* Laveran, 'Du Paludisme,' Paris, 1891.

† *Vide* Laveran, *op. cit.*

The process of sporulation might seem at first sight to explain the whole life-history of the parasites. For their propagation within the human body that process does indeed make ample provision. But the mystery remained—how did they gain entrance into the human system? Though present in abundance in the blood of the malarial patient, they are absent from the excreta. Spontaneous generation having been long since exploded, what could be their mode of origin in the external world? This problem has of late been completely solved.

Among the forms of the parasite observed by Laveran was one which he termed "flagellated"; possessing filamentous appendages which exhibited extremely active movements, by virtue of which they were often seen to break off from the parent microbe and swim away. These flagella were regarded by many biologists as products of degeneration resulting from the abnormal influences to which the parasites were exposed in blood outside the body. This Laveran could not believe. Indeed, it was the remarkable activity of the flagella that finally satisfied his own mind that what he had discovered were really living parasites; he regarded the flagella as the highest form of development of the microbe. There was another observer who felt equally convinced that the flagella were living elements—our Fellow, Dr. Manson. He, however, went a step further. Seeing that the flagella were never met with in blood when first drawn, but only made their appearance after some little time had elapsed, he conceived that their function must be that of spores for spreading the parasite in the external world, and some suctorial insect seemed to him the probable agency for their diffusion. He had observed several years ago that another parasite of the human blood, a microscopic nematode worm, Filaria, is drawn with the blood into the stomach of a kind of mosquito, and finds in the insect a secondary host, in the tissues of which it passes through a new cycle of development. He became deeply impressed with the idea that a similar series of events might occur with malaria, and he expounded his views fully before the College of Physicians. The notion that mosquitoes might be in some way associated with malaria had occurred to Laveran and to others, but by no one had it been brought home with such logical force as by Manson.

Major Ronald Ross, of the Indian Medical Service, on a visit to this country, became deeply impressed by Manson's arguments, and determined to test his theory on returning to India. Using mosquitoes bred in bottles from the larva, he caused them to bite persons affected with the crescent form of malaria, and afterwards sought in the bodies of the insects for evidence of the development of the parasite within them. For two long years he pursued this search, making about a thousand observations, but to no purpose. So far he had employed two kinds of mosquito common in the district where he was stationed; but in August, 1897, having been supplied with some larvæ of a species

rare in that locality, and having bred the fully-developed insects from them, he induced eight of them to bite a patient with crescents in his blood, and examined their tissues at successive periods. Four of them were killed at once, for the investigation of the flagellated bodies. Of the remainder, one examined four days after biting showed under a high magnifying power several rounded bodies embedded in the wall of the stomach, differing from any natural structure of the insect, and containing granules of pigment "identical in appearance to that of the parasite of malaria."* The eighth mosquito was killed one day later, and exhibited bodies precisely similar, except that they were distinctly larger and more substantial, implying that they had grown in the interval. Thinking that in all probability he had at length found that which he had been so long in search of, and feeling uncertain when he might again obtain the rare species of mosquito for confirmatory investigation, he at once sent a description of his observations to London, accompanied by his preparations, and an independent report upon them by a colleague. Dr. Manson, to whom among others they were submitted, was so much struck with the preparations, that he had a drawing made of the pigmented bodies in them, for publication along with Ross's paper. Though, like Ross, expressing himself with caution, he inclined to his interpretation of the appearances. The paper contained a minute description of the rare mosquito, which seemed to Ross to belong to a "family distinct from the ordinary" kinds.

In the following month he made a similar experiment with another species of mosquito, which appeared closely allied to the subject of his last observations. He succeeded, though with some difficulty, in getting two of them to bite a patient with crescents. One of these insects, killed next day, was examined, with a negative result; but in the second, killed forty-eight hours after biting, the peculiar pigmented bodies were again seen among the tissues of the stomach. Meanwhile, "some scores" of the same species "unfed or fed on healthy blood, had been examined without finding the cells."

In the same month he observed precisely similar pigmented bodies in a common mosquito which he had seen feeding on a patient affected with the parasite of mild tertian fever. Here he had not the rigorous evidence supplied by insects bred from the larva:† and it was quite a new thing to find the pigmented bodies in ordinary mosquitoes. But all the patients on whom his previous observations on the common species had been made, had been affected with crescents; and the para-

* *Vide* 'British Medical Journal,' Dec. 18, 1897.

† *Vide* 'British Medical Journal,' Feb. 26, 1898. In this second paper Ross did not repeat the description of his method, given in the former article, of using mosquitoes bred in bottles from the larva; but as that had been his practice for more than two years, there can be no reasonable doubt that he continued it with this new species. I have also his personal assurance that such was the case.

site concerned being in this case a new species, it did not seem unlikely that it might be harboured by the common insects.* These new facts removed all doubt from his mind, and he felt that he had the subject in his grasp, and wrote to that effect to Manson. But, to his bitter disappointment, he was at this time despatched to another part of India to study another disease, and thus several precious months were lost.

In February, 1898, however, he was told off for the special investigation of malaria, and a laboratory in Calcutta was set apart for his use.† Few cases of human malaria being available at that season of the year, he turned his attention to some closely allied forms of disease common in birds. He soon found that one of the ordinary kinds of mosquito, which had invariably given negative results when fed on patients with crescents, developed pigmented bodies among the tissues of the stomach if fed on birds, such as sparrows, containing in their blood the form of bird parasite known as Proteosoma. The birds presented a ready field for experiment, and the kind of mosquito, the grey mosquito as he termed it, was very abundant in Calcutta, so that it was easy for him to hatch from the larva any number that he might require. Discoveries now followed each other in quick succession. He soon announced that the pigmented bodies grew rapidly from day to day, till after about a week they had assumed large proportions, projecting like buttons from the outer surface of the stomach, and often showing a curious appearance of radiating striæ. Next we learned that the striæ had been indications of spore formation, and that when the bodies had attained maturity they burst into the general body cavity, discharging enormous numbers of minute elongated organisms which he termed "germinal rods." Then followed the remarkable observation that the germinal rods soon leave the general body cavity and accumulate in the cells of the salivary or poison glands and in the duct leading from them to the proboscis with which the bites of the insect are inflicted. And lastly he completed the cycle of evidence by ascertaining that healthy sparrows could be infected with the proteosoma by causing mosquitoes to bite them at the appropriate period after biting an infected bird.

Thus was in truth established the mosquito theory of malaria. For, taking into account the close resemblance of the proteosoma to human malarial parasites, together with the facts ascertained by Ross regarding the infection of the rare mosquitoes with human crescents, we could not doubt that the course of events which he had traced in the sparrow occurred also in man. And the two sets of observations taken together clearly established the fact that, as Manson had predicted, different

* As the result of further knowledge, there is no doubt that this common mosquito had derived its pigmented bodies, not from the man it was seen biting, but from a bird affected with another species of malarial parasite.

† It has seemed necessary to refer to these points in detail, as considerable misapprehension has prevailed in some quarters regarding them.

species of malarial parasite may require different kinds of mosquito as their alternative hosts.

At the same time the presence or absence of the pigmented bodies in the stomach wall afforded a sure means of distinguishing those kinds of mosquitoes which convey malaria to man from those which are incapable of doing so. And it may be added that the multitude of negative results after feeding grey mosquitoes with crescent blood, considering the great prevalence in Indian birds of the parasite with which that species of insect is liable to be infected, afforded pretty conclusive evidence that the mosquito never derives the germs of malaria from the larva, and can acquire them only by biting some infected animal.

But although the mosquito theory was thus demonstrated, there remained a link wanting in the chain of biological sequence. The flagella which Manson regarded as spores were destitute of malarial pigment, whereas the smallest corpuscles seen by Ross in the stomach wall invariably possessed it. How was this inconsistency to be explained? What was the relation of the unpigmented flagellum to the pigmented corpuscle? The answer had been already independently supplied.

I was present at a sitting of the Zoological Section of the British Association at the Toronto Meeting in 1897, when Dr. MacCallum, a young pathologist of the Johns Hopkins University at Baltimore, read a paper describing the results of an investigation in which he had long been engaged, into another form of malaria parasite, Halteridium, especially common in crows. He told us, and he illustrate his statements with preparations under the microscope, that he had distinguished differences, which he regarded as fundamental, between the spherical bodies seen in the shed blood of a bird affected with that parasite. Though alike in size, some had more granular protoplasm than the others, which had a more hyaline aspect; and he had observed that the more hyaline ones alone emitted flagella. These, after wriggling themselves free from the parent cell, swam away till they approached some corpuscle of the other, more granular, sort; when the first that reached it plunged into its substance and disappeared, while all others were by some amazing provision absolutely refused entrance. Here then was witnessed in an exceedingly low form of animal life a process of fertilisation identical with that which occurs in an echinus or a fucus. The flagella were neither more nor less than spermatozoa, and the more granular cells were ova. As the result of the fertilisation, the female cell was seen by MacCallum to alter its shape in the shed blood and assume an elongated form, to which the term Vermiculus was applied. This new creature was possessed of wonderful powers of locomotion; sometimes in its powerful career piercing through the substance of a red corpuscle.* Nothing could well be imagined better

* *Vide* "On the Hæmatozoan Infection of Birds," by W. G. MacCallum, M.D., 'Journal of Experimental Medicine,' vol. 3, No. I, 1898.

adapted for penetrating the layer of cells that line the stomach of the mosquito; and as the vermiculus retained its pigment, Ross's pigmented bodies were naturally accounted for.

These observations of MacCallum's might seem at first almost too wonderful for credence; but they have been fully confirmed by others.

It appears to be doubtful whether halteridium ever produces the "rosace" form, with its attendant sporulation; but there is no doubt that the process of fertilisation seen in that parasite occurs in human malaria. MacCallum himself observed the act of fertilisation in the crescentic human form; though he did not see the subsequent development of the vermiculus. Koch made a further step by observing the vermiculus of proteosoma in blood from the mosquito's stomach.* And finally our medallist, Grassi, who in other ways has made most important contributions to this subject, has in a recent work,† accompanied by very beautiful illustrations, not only described the presence of vermiculi in abundance in the blood in the stomach of mosquitoes during the first two days after biting patients affected with malaria, but he has traced and figured the pigmented bodies of the smallest size in the tissues of the stomach in the immediately succeeding period, these bodies retaining in some instances the elongated form of the vermiculus after passing through the layer of epithelium that lines the cavity of the organ.

It has thus been abundantly established that the parasites of malaria are present in the patient's blood in two distinct forms, one sporulating asexually in the human system and causing the attacks of fever, the other undergoing sexual development in the body of the mosquito. That both forms are developed from the spores introduced by the mosquito is certain. At what stage they begin to develop their respective peculiarities is not yet quite made out. The crescent form is peculiarly favourable for this inquiry, as it is the crescents only which discharge the sexual function, and they are easily distinguished from the sporulating kind, not only by their shape, but also by their much larger size.

The development of the crescents has been specially studied by the Italian pathologists Bastianelli and Bignami,‡ who have been able to distinguish the young crescents while still of extremely small dimensions; and they have made the remarkable observation that, while the crescents are as a rule only found in the blood of the finger when they

* *Vide* "Ueber die Entwickelung der Malaria Parasiten," R. Koch, 'Zeitschrift für Hygiene und Infectionskrankheiten,' Bd. xxxii, 1899. Exceedingly beautiful micro-photographs of different malaria parasites in various stages of development accompany this article.

† *Vide* Grassi, 'Studi di uno Zoologo sulla Malaria,' Roma, 1900.

‡ *Vide* 'Sulla Struttura dei Parassiti Malarici,' per G. Bastianelli ed A. Bignami Società per gli Studi della Malaria, 1899.

have arrived at maturity, the young forms are to be seen in internal organs, such as the spleen, but above all in the bone marrow, where alone, according to these observers, the youngest recognisable crescents are to be found.

Seeing that, in whatever part of the body they are, the parasites always inhabit the blood, it seems difficult to conceive what can be the cause of their preference, at different stages of their growth, for the blood vessels of different regions and organs. But of this we find parallels in several other cases of blood parasites; the most striking, perhaps, being the astonishing fact that, of two species of Filaria that infest the human blood, one only shows itself in superficial parts at night, and is therefore termed *Filaria nocturna*, while the other has the name *Filaria diurna*, because it only appears by day in the finger blood, and retreats into deep parts for the night.

Ross was not an entomologist, and he was unable to learn in India the names of the species of mosquito with which he had been working, till Daniels, one of the explorers sent out by the Malaria Committee, having gone to Calcutta to confirm or otherwise Ross's work, informed him that his rare kinds, which acted as hosts for the human crescents, belonged to the genus Anopheles, and that the common sort which performed the same office for proteosoma, belonged to another genus, Culex. It has been a matter of great interest to ascertain whether all mosquitoes which act as conveyors of malaria to man are of the genus Anopheles, and the exceedingly common and numerous species of Culex are guiltless in that respect. Very numerous investigations into this question, and especially those conducted by Grassi and his coadjutors, seem to have proved that such is the case, and that, so far as human malaria is concerned, anopheles alone have to be considered.

Our other two explorers, Messrs. Christophers and Stephens, have made various important contributions to our knowledge of malaria. Thus having paid special attention to the very dangerous disease which, on account of one of its symptoms, is termed blackwater fever, they have come distinctly to the conclusion that it is not a special disorder but a form of tropical malaria. If this is the case, it is of immense practical importance, for it will follow that any preventive measures efficacious for ordinary malaria will prove equally so for the deadly blackwater fever.

Another most important fact which they have ascertained, and which was independently observed by Koch, is that in a native population in a malarious region, while the adults may be perfectly free from the disease, an enormously large percentage of the young children contain the parasites in their blood. Though the disease appears to be much less dangerous to the native children than to new arrivals, implying that they have a degree of congenital immunity, the parasites in the young natives are perfectly efficacious for causing dangerous fever in

white people, when conveyed to them by mosquitoes. Hence the important practical inference that white people settling in a malarious tropical region should not, as they now commonly do, plant their houses near native settlements, but place them at some considerable distance from them, about a quarter of a mile being apparently sufficient. And Christophers and Stephens in their last communication have gone so far as to express the opinion that the following of this simple rule would go very far indeed towards rendering the malarious tropics healthy to Europeans.

In a communication to this Society it is the scientific side rather than the practical that is naturally chiefly dwelt on. Yet I should have been glad, had time permitted, to have referred to the various measures of prevention and treatment of malaria which the light of recent knowledge has suggested, and which have already borne important fruit. I must now content myself with saying that, very various as these measures are, they are all, without exception, based on the mosquito theory.

Copley Medal.

Professor Marcellin Berthelot, For. Mem. R.S.

The Copley Medal is awarded to M. Marcellin Berthelot, Senator, formerly Minister for Foreign Affairs, Member of the Institute of France, and a Foreign Member of this Society, for his eminent services to Chemical Science.

M. Berthelot has been an indefatigable worker in almost every field of chemical inquiry for upwards of fifty years. Some idea of his ceaseless activity may be gathered from the fact that his contributions to chemical literature already number close upon a thousand, and range over practically every department of the science—philosophical, historical, physical, pure and applied. It is, however, not the mere number, but the remarkable outcome of these memoirs that excites our admiration. Multifarious as the labour may appear, it will be found to have been directed to the solution of broad fundamental issues. It is this circumstance which makes the classification of M. Berthelot's contributions to chemical literature—diverse and many-sided as they may at first sight seem—comparatively easy.

His studies on chemical synthesis, and his researches on the ethers and etherification, on the hydro-carbons and on the sugars—great groups of chemical substances—are among the classics of organic chemistry. Not less noteworthy are his investigations into the theory of explosion, of solution, of dissociation and distillation; these have served not only to elucidate obscure phenomena, but have had immediate and far-reaching results in practical application. His thermo-

chemical labours, and his studies on affinity, on chemical equilibrium, and on the mechanism of chemical reactions constitute special chapters in the history of a department of science which has practically seen its rise during the period of M. Berthelot's intellectual activity, and with which his name is indissolubly connected, as one of the greatest of pioneers.

Although these labours have been mainly directed to the philosophical aspects of chemistry, yet, following the example of his great countryman, Lavoisier—whose biography he has written—M. Berthelot has devoted a not inconsiderable part of his energy to the economic and industrial applications of the science, and more especially to the practice of agriculture. This has borne valuable fruit in the long succession of memoirs on Agricultural Chemistry which have appeared in the 'Annales de Chimie et de Physique,' and which are unquestionably among the most important contributions made by any French writer to the science of Agriculture.

By this award of the Copley Medal—the greatest honour which is in its power to bestow—the Royal Society desires to show its high appreciation of a half-century's unwearied and unselfish scientific labour—labour as rich in positive achievement as it is fruitful and suggestive in ulterior consequence.

Rumford Medal.

M. Antoine Henri Becquerel.

The Rumford Medal is given to M. Antoine Henri Becquerel.

M. Henri Becquerel discovered that uranium at ordinary temperatures emits a radiation which resembles in many respects Röntgen rays, inasmuch as it can affect a photographic plate after passing through thin layers of metal; the radiation also makes any gas through which it passes a conductor of electricity. This discovery adds a new and most interesting region to Physical Science, the importance of which is shown by the remarkable results which have been obtained by the subsequent investigations of M. Becquerel himself, of M. and Madame Curie, of Giesil, Schmidt, Rutherford, and Sir William Crookes.

Royal Medal.

Major Percy Alexander MacMahon, R.A., F.R.S.

One of the Royal Medals is bestowed upon Major Percy Alexander MacMahon.

Since 1880, Major MacMahon has been distinguished by the number and range of his contributions to mathematical science. His work has been almost, if not entirely, confined to the depart-

ment of pure mathematics, but some idea may be formed of its magnitude and importance from the fact that since the date named he has communicated no less than sixty-one papers and memoirs, which have been published in the 'Philosophical Transactions' of the Royal Society and of the Cambridge Philosophical Society; in the 'Comptes Rendus de l'Académie des Sciences'; in the 'Proceedings of the London Mathematical Society'; in the 'American Journal of Mathematics'; in the 'Quarterly Journal of Mathematics,' and in the 'Bulletin de la Société Mathématique de France.'

His work is distinguished for great originality, research, and precision.

Royal Medal.

Professor Alfred Newton, F.R.S.

The other Royal Medal is conferred on Professor Alfred Newton, in recognition of his eminent services to the science of Ornithology and of Zoo-geographical Distribution.

Professor Newton has devoted himself for the last fifty years to the study of Ornithology; and the 'Dictionary of Birds' (A. and C. Black, London, 1893–96) may well be called the *résumé* of his labours.

Professor Newton's work is eminently critical—a model of careful and cautious criticism of everything pertaining to his favourite branch of science. His 'Dictionary of Birds' is the acknowledged standard work on Ornithology, the progress of which science in this country is due mainly to his critical, suggestive, and stimulating influence. His personal labours refer chiefly to historical, systematic, and faunistic questions. It is by his untiring efforts that the vexed question of nomenclature and synonymy has been practically settled, and has been put on its present footing. He is also one of the leading authorities in the modern branch of zoo-geography, which owes some of the most important modifications and generalisations to him. Lastly, it is only fair to mention that he is one of the few zoologists among his contemporaries who, from the first, embraced the doctrine of evolution according to Darwinian principles.

Davy Medal.

Professor Guglielmo Koerner.

The Davy Medal is conferred upon Professor Guglielmo Koerner. The extraordinary importance of the theory enunciated by Kekulé in 1865, that the hydrocarbon benzene is to be regarded as consisting of six CH groups symmetrically disposed in a ring, is well known to chemists. No theory has had a wider use in guiding practice, as, apart from its abstract value, the theory is the basis on which a colossal

modern industry reposes, viz., the industry which numbers among its products not only the "coal tar colours," but many medicinal agents and perfumes, and saccharin, the substitute for sugar, &c.

But as it issued from Kekulé's mind the theory was but a brilliant abstraction which needed the labours of many chemists, not so much to establish its truth as to make it available. From the outset, numerous attempts were made to determine the constitution of the derivatives of benzene in terms of the theory, but they were speculative in character, and contradictory results were arrived at. In this condition of affairs, as no absolute method was available, the theory was of little use as a practical guide.

Suddenly, in 1874, the veil was lifted by Wilhelm Koerner, who then made public the results of long years of labour in a classic memoir, entitled "Research in Immersion amongst the so-called Aromatic Substances containing Six Atoms of Carbon," which was published in the 'Gazzetta Chimica Italiana.'

In this memoir a large number of derivatives of benzene, many of them new, were discussed and co-ordinated, and a series of reference compounds was established. It was shown that the absolute relative position of the groups in benzene derivatives could be determined by taking three isomeric di-derivatives, and ascertaining the number of tri-derivatives into which they could be converted. And numerous proofs were given that the method could be successfully applied.

The problem was solved, and no difficulty has since been experienced. Only chemists fully conversant with such work, and with the conditions which then prevailed, can appreciate the magnitude of Koerner's labours and their importance.

Feeble health obliged him to take up his residence in Italy, but he has never ceased to labour in the field in which he first secured success.

He is noted also on account of his remarkable experimental skill, and of the care and accuracy with which all his work has been performed.

Darwin Medal.

Professor Ernst Haeckel.

The Darwin Medal is given to Professor Ernst Haeckel.

Professor Haeckel, of Jena, is one of the foremost naturalists of the century, and one whose whole work has been inspired by the evolutionary spirit. One of the earliest of his larger works, 'Die Generelle Morphologie,' is justly regarded as one of the greatest books of our time, and many morphologists have expressed their indebtedness to it for suggestions and guidance. His purely observational and descriptive work, as a field naturalist and as a laboratory worker, has been

most extensive, and has covered a wide range of subjects. He has written four great "Challenger" Reports, consisting of over 3000 pages and some hundreds of beautiful plates, and has made known to science many remarkable new organisms amongst the Medusæ, the Sponges, and the microscopic Radiolaria. He has been one of the busiest and most productive zoologists of the century; and for his monographs alone he deserves any honour which this Society can bestow upon him.

But it is peculiarly appropriate that Haeckel should receive the Darwin Medal, because he has contributed most notably to the special literature of Darwinism, and has played in Germany very much the same part that Huxley did in this country as the defender and expounder of evolution in general and the Darwinian theory in particular. Both Huxley and Darwin speak highly of Haeckel's services, and of the influence of his more popular works in spreading a knowledge of Darwinian views amongst the educated public. It was Haeckel's advocacy of evolution that placed Darwinian questions for the first time publicly before German science, and his enthusiastic propagandism that chiefly contributed to its success in that country. Huxley, in his 'Evolution in Biology,' speaking of Haeckel, says:—"His attempt to systematise the doctrine of evolution, and to exhibit its influence as the central thought of modern biology, cannot fail to have a far-reaching influence on the progress of science." Charles Darwin, in more than one passage in his 'Life and Letters,' speaks with admiration and gratitude of Haeckel's services to science, and of his co-operation as an evolutionist. Haeckel's enthusiasm and inspiring personality have had a great effect upon his pupils, many of whom are now distinguished zoologists and evolutionists. It is mainly due to Haeckel's influence and efforts that at Jena there are now two professorships devoted to the exposition of evolution—the Ritter Professorships of Phylogeny and Ontogeny.

This Medal has been given in the past to Wallace, Hooker, and Huxley. The next man after these honoured contemporaries of Darwin who stands out amongst European naturalists as the foremost evolutionist, is certainly Ernst Haeckel.

In obedience to an unwritten law—which I believe to be a salutary one—I am now addressing the Society for the last time from this chair. I rejoice that we are able to commend to your suffrages for my successor a man whose world-wide renown ensures universal recognition of his eminent worthiness of this high office.

It has given me great satisfaction during the last five years to witness the ever-increasing importance of the work of the Society I am well aware that I can lay no claim to having had any share in the promotion of this prosperity, which has been due to those of our

Fellows who have brought the best fruits of their labours before us in this room, and also in large measure to the self-denying exertions of my brother-officers, to whom I beg to express my warm thanks, not only for their invaluable services to the Society, but also for their unvarying kindness to myself. I venture also to thank the entire body of Fellows for the constant consideration and courtesy which I have experienced from them during my term of office.

On the motion of Lord Kelvin, seconded by Sir A. Geikie, a vote of thanks was accorded to the President for his address, with a request that he would allow it to be printed.

The Statutes relating to the election of Council and Officers were then read, and Professor Cotterill and Mr. Warrington having been, with the consent of the Society, nominated Scrutators, the votes of the Fellows present were taken and the following we declared duly elected as Council and Officers for the ensuing year:—

President.—Sir William Huggins, K.C.B., D.C.L., LL.D.

Treasurer.—Alfred Bray Kempe, M.A.

Secretaries.—Sir Michael Foster, K.C.B., D.C.L., LL.D.; Professor Arthur William Rücker, M.A., D.Sc.

Foreign Secretary.—Thomas Edward Thorpe, C.B., Sc.D.

Other Members of the Council.—Professor Henry Edward Armstrong, LL.D.; Charles Vernon Boys; Horace T. Brown, LL.D.; William Henry Mahoney Christie, C.B.; Professor Edwin Bailey Elliott, M.A.; Hans Friedrich Gadow, Ph.D.; Professor William Mitchinson Hicks, M.A.; Lord Lister, F.R.C.S.; Professor William Carmichael McIntosh, F.L.S.; Ludwig Mond, Ph.D.; Professor Arnold William Reinold, M.A.; Professor J. Emerson Reynolds, Sc.D.; Robert Henry Scott, Sc.D.; Professor Charles Scott Sherrington, M.D.; J. J. H. Teall, M.A.; Sir John Wolfe Barry, K.C.B.

The thanks of the Society were given to the Scrutators.

INCOME AND EXPENDITURE ACCOUNT.

GENERAL PURPOSES.

November 12, 1899, *to November* 10, 1900.

INCOME.

	£	s.	d.	£	s.	d.
To **Fees**—						
Admissions	20	0	0			
Compositions	60	0	0			
Annual Contributions, 243 at £3 / 86 at £4	1,073	0	0			
,, ,,						
Fee Reduction Fund	397	0	0			
				1,550	0	0
,, **Investments**—						
Rents...	694	13	11			
Dividends and Interest	2,539	3	10			
Income Tax Recovered	105	17	11			
				3,339	15	8
,, **Publications**—						
Sales:						
"Philosophical Transactions"	576	5	1			
"Proceedings"	196	3	4			
Other Sales	7	5	11			
	779	14	4			
Less Commission	71	8	4			
	708	6	0			
,, Government, Publication Grant ...	1,000	0	0			
				1,708	6	0
,, **Catalogue**—						
Sales	4	10	0			
Transfer from Handley Fund ...	190	15	11			
,, ,, Proceeds of Atlas Policy	200	0	0			
Index, Transfer from Dr. L. Mond's Gift	225	0	0			
				620	5	11
Total Ordinary Income ...				7,218	7	7

EXPENDITURE.

	£	s.	d.	£	s.	d.
By **Establishment Expenses**—						
Salaries and Wages	1,937	1	9			
Office Expenses	137	5	0			
House Expenses	71	14	8			
Coal and Lighting	191	4	11			
Fire Insurance	55	5	0			
Advertising	19	11	6			
Postages and Petty Charges ...	101	11	10			
Printing, Miscellaneous	228	5	3			
Tea Expenses	14	5	6			
Taxes...	14	10	1			
Law Charges	17	10	9			
Soirées and Receptions	240	4	9			
Anniversary...	19	1	0			
Miscellaneous	64	1	8			
Electric Plant, Inspection and Repairs	26	12	2			
				3,138	5	10
,, **Library**...	...		...	294	18	0
,, **Publications**—						
"Philosophical Transactions"—	£	s.	d.			
Printing	479	10	0			
Paper	233	5	10			
Engraving and Lithography ...	448	17	4			
Binding	45	5	0			
				1,206	18	2
"Proceedings"—						
Printing	529	9	8			
Paper	86	1	3			
Engraving and Lithography ...	131	11	0			
Binding	2	14	0			
				749	15	11

Year Book—							
Printing	43	12	11				
Binding	9	5	6				
Engraving and Lithography (1901)	6	18	6				
				59	16	11	
				2,016	11	0	
Grants for Extraneous Publications ...	220	0	0				
Do. do. not yet claimed... ...	291	13	4				
				511	13	4	
						2,528	4 4
,, **Catalogue**—							
Catalogue of Scientific Papers ...				806	11	9	
Index...				244	8	8	
						1,051	0 5
Total Ordinary Expenditure ...						7,012	8 7
,, **Balance**, being excess of Income over Expenditure for year						205	19 0
						£7,218	7 7

£7,218 7 7

CASH ACCOUNT.

GENERAL PURPOSES.

November 12, 1899, *to November* 10, 1900.

RECEIPTS.	£	s.	d.
To Balance at Bank, 12th Nov., 1899—Deposit Account (Dr. L. Mond's Gift)	389	3	0
„ Balance at Bank, Current Account...	1,539	3	1
„ Balance in hand, Petty Cash	40	7	9
„ Receipts as per Income and Expenditure Account, excluding £200 part proceeds of Atlas Policy now transferred from Catalogue Reserve to General Purposes	7,018	7	7
„ Other Receipts, namely—			
Interest on Bank Deposit	12	14	5
International Catalogue, Grant from Donation Fund	150	0	0
Malaria Research, Government Grant ...	300	0	0
	£9,449	15	10

PAYMENTS.	£	s.	d.
By Payments as per Income and Expenditure Account, excluding £291 13*s.* 4*d.* Grants not yet paid...	6,720	15	3
„ Other Payments, namely—			
Tsetse Fly Report...	40	0	0
Malaria Research	359	16	10
International Catalogue, General Account ...	157	13	0
„ „ Loan Account ...	191	13	4
Carrington Gift, 5 quarters	37	10	0
Electric Plant	35	14	0
Withdrawn from Deposit Account	225	0	0
„ Balance at Bank, 10th Nov., 1900—Deposit Account (Dr. L. Mond's Gift)	176	17	5
„ Balance at Bank, Current Account...	1,478	1	4
„ „ on hand, Petty Cash	26	14	8
	£9,449	15	10

BALANCE SHEET.

GENERAL PURPOSES.

November 10, 1900.

Liabilities.	£ s. d.	£ s. d.
To Tsetse Fly Account, Grant unexpended per last Balance Sheet	88 3 3	
Less Payments during year ...	40 0 0	
		48 3 3
„ Carrington Donation—		
Balance of Grant unexpended per last Balance Sheet	127 10 0	
Less Payment during year ...	37 10 0	
		90 0
„ International Catalogue—		
Amount unexpended per last Balance Sheet	8 1 4	
Amount of Grant from Donation Fund	150 0 0	
	158 1 4	
Less Payments during year ...	157 13 0	
		8 4
„ Catalogue Account—		
Balance unapplied at date of last Balance Sheet	1,000 0 0	
Less Transferred to Income and Expenditure Account for Catalogue	200 0 0	
		800 0 0
Carried forward...		938 11 7

Assets.	£ s. d.	£ s. d.
By Cash at Bankers	1,478 1 4	
„ Do. in hand	26 14 8	
„ Do. on Deposit (Dr. Ludwig Mond)...	176 17 5	
		1,681 13 5
„ Tsetse Fly Report, to be repaid by Natal Government as per last Balance Sheet		142 4 2
„ International Catalogue Loan Account—		
Payments during year		191 13 4
„ Malaria Research Grant—	£ s. d.	
Payments during year	359 16 10	
Less Donation from—		
Government Grant £300 0 0		
Balance unexpended per last Balance Sheet 0 11 2		
	300 11 2	
		59 5 8
„ Electric Plant—		
Payment during year on account of New Installation		35 14 0
Carried forward...		2,110 10 7

BALANCE SHEET. GENERAL PURPOSES—*continued.*

Liabilities.	£	s.	d.	£	s.	d.
Brought forward...				938	11	7
To Catalogue Index—						
Amount of Dr. L. Mond's Gift not applied per last Balance Sheet ...	389	3	0			
Add Interest for year	12	14	5			
	401	17	5			
Less Transferred to Income and Expenditure Account	225	0	0			
				176	17	5
„ Publication Grant—						
Grants for Extraneous Publications not yet claimed				291	13	4
„ Income and Expenditure Account—						
Balance as per last Balance Sheet ...	497	9	3			
Add Excess of Income over Expenditure for year	205	19	0			
				703	8	3
				£2,110	10	7

Assets.	£	s.	d.
Brought forward...	2,110	10	7
	£2,110	10	7

ESTATES AND PROPERTY OF THE ROYAL SOCIETY.

GENERAL PURPOSES.

Estate at Mablethorpe, Lincolnshire (55A. 2R. 2P.), rent £75 per annum.
Ground Rent of House, No. 57, Basinghall Street, rent £380 per annum.
" " of 23 houses in Wharton Road, West Kensington, rents £253 per annum.
Fee Farm Rent, near Lewes, Sussex, £19 4*s.* per annum.
Stevenson Bequest. Chancery Dividend. One-fourth annual interest on Balance of Bequest still in Court. (This year, £91 14*s.* 7*d.*)
£15,200 Mortgage Loan, 3½ per Cent., to the Duke of Norfolk.
£3,518 0*s.* 3*d.*, 2¾ per Cent. Consolidated Stock in Chancery, arising from sale of the Coleman Street Estate.
£3,000 India 3½ per Cent. Stock.
£1,300 India 3 per Cent. Stock.—(Earl of Derby's Bequest).
£592 5*s.* 9*d.* Midland Railway 2½ per Cent. Perpetual Guaranteed Preference Stock.—(Stevenson Bequest).
£5,000 Madras Railway Guaranteed 5 per Cent. Stock.
£2,725 Great Northern Railway 4 per Cent. Perpetual Preference Stock.—(Stevenson Bequest).
£14,908 London and North Western Railway 4 per Cent. Consolidated Guaranteed Stock.—{ £12,150 General Purposes. / £2,758 " " (Stevenson Bequest).
£5,000 " " " " Consolidated 4 per Cent. Preference Stock.
£5,000 North Eastern Railway 4 per Cent. Preference Stock.
£2,760 " " " Consolidated 4 per Cent. Guaranteed Stock.—(Stevenson Bequest).
£3,333 London and South Western Railway 4 per Cent. Preference Stock.
£4,000 Southern Mahratta Railway 4 per Cent. Debenture Stock.
£176 17*s.* 5*d.* on Deposit Account at Bank, Dr. Ludwig Mond's Gift.—Catalogue Account.

TRUST FUNDS. CASH ACCOUNTS, 1900.

Scientific Relief Fund.

£6,000 L. & N.W. Railway 4 per Cent. Consolidated Guaranteed Stock.
£7,200 Great Northern Railway 3 per Cent. Debenture Stock.
£4,340 South Eastern Railway 5 per Cent. Debenture Stock.
£800 2½ per Cent. Annuities.

Dr.

	£ s. d.	£ s. d.
To Balance, Income	1,518 7 6	
Less Temporarily Invested ...	885 17 10	632 9 8
„ Dividends		666 18 7
Grant from Royal Bounty Fund		300 0 0
Income Tax recovered		21 18 11
		£1,621 7 2

Cr.

	£ s. d.	£ s. d.
By Grants		819 0 0
„ Balance, Income	1,688 5 0	
Less Temporarily Invested ...	885 17 10	802 7 2
		£1,621 7 2

Donation Fund.

£5,030 Great Northern Railway Perpetual 4 per cent. Guaranteed Stock.
The Trevelyan Bequest. £1,861 6*s.* 8*d.* Great Northern Railway 3 per Cent. Debenture Stock.

	£ s. d.	£ s. d.
To Balance		582 0 11
„ Dividends		247 8 2
„ Transfer from Jodrell Fund		141 1 8
„ Income Tax recovered		8 2 8
		£978 13 5

	£ s. d.	£ s. d.
By Grants		391 19 0
„ Balance		586 14 5
		£978 13 5

Rumford Fund.

£2,367 2*s.* 6*d.* 2¾ per Cent. Consolidated Stock.

	£	*s.*	*d.*		£	*s.*	*d.*
To Balance	64	19	8	By Balance	129	8	6
„ Dividends	62	7	6				
„ Income Tax recovered	2	1	4				
	£129	8	6		£129	8	6

Bakerian and Copley Medal Fund.

Sir Joseph Copley's Gift. £1,666 13*s.* 4*d.* 2¾ per Cent. Consolidated Stock.
£403 9*s.* 8*d.* 2½ per Cent. Annuities.

	£	*s.*	*d.*		£	*s.*	*d.*
To Balance	95	13	6	By Gold Medal—Lord Rayleigh	4	13	0
„ Dividends, New 2½ per Cent. Stock	9	13	4	„ Gift „ „	50	0	0
„ Dividend—Sir J. Copley's Fund	43	18	8	„ Bakerian Lecture—Professor Tilden	4	0	0
„ Income Tax recovered	1	15	3	„ Balance	92	7	9
	£151	0	9		£151	0	9

The Keck Bequest.

£960 Midland Railway 2½ per Cent. Debenture Stock (converted from £800 Midland Railway 3 per Cent. Debenture Stock).

	£	*s.*	*d.*		£	*s.*	*d.*
To Balance	23	19	2	By Payment to Foreign Secretary	23	17	2
„ Dividends	23	2	0	„ Payment to Executors of late Foreign Secretary ...	23	19	2
„ Income Tax recovered	0	15	2				
	£47	16	4		£47	16	4

Wintringham Fund.

£1,200 2¾ per Cent. Consolidated Stock.

	£	s.	d.		£	s.	d.
To Balance	32	18	10	By Payment to Foundling Hospital	32	18	10
„ Dividends	31	12	6	„ Balance	32	13	5
„ Income Tax recovered	1	0	11				
	£65	12	3		£65	12	3

Croonian Lecture Fund.

One-fifth of the clear rent of an Estate at Lambeth Hill, from the College of Physicians, about £56 per annum.

	£	s.	d.		£	s.	d.
To Balance	8	6	1	By Lecture (1900)—Professor P. Ehrlich	50	0	0
„ Rent	54	5	3	„ Balance	14	4	3
„ Income Tax recovered	1	12	11				
	£64	4	3		£64	4	3

Davy Medal Fund.

£660 Madras Railway Guaranteed 5 per Cent. Stock.

	£	s.	d.		£	s.	d.
To Balance	52	10	5	By Gold Medal—Edward Schunck	32	5	6
„ Dividends	31	12	6	„ Balance	52	18	4
„ Income Tax recovered	1	0	11				
	£85	3	10		£85	3	10

The Gassiot Trust.

£10,000 Italian Irrigation Bonds.

£500 2¾ per Cent. Consolidated Stock.

	£	s.	d.		£	s.	d.
To Balance	144	6	8	By Payment to National Physical Laboratory	454	4	1
„ Dividends	452	8	4	„ Purchase of £200 Italian Irrigation Bonds	224	6	0
„ £200 Bonds drawn	232	0	0	„ Balance	165	4	4
„ Income Tax recovered	14	19	5				
	£843	14	5		£843	14	5

Handley Fund.

£4,798 Lancashire and Yorkshire Railway 4 per Cent. Guaranteed Stock.

	£	s.	d.		£	s.	d.
To Dividends	184	14	4	By Transfer to Catalogue Account	190	15	11
„ Income Tax recovered	6	1	7				
	£190	15	11		£190	15	11

The Jodrell Fund.

£5,182 14*s.* 10*d.* 2¾ per Cent. Consolidated Stock.

	£	s.	d.		£	s.	d.
To Dividends	136	11	8	By Transfer to Donation Fund	141	1	8
„ Income Tax recovered	4	10	0				
	£141	1	8		£141	1	8

Fee Reduction Fund.

£5,100 Metropolitan 3½ per Cent. Stock.

£9,333 London and North Western Railway 3 per Cent. Perpetual Debenture Stock.

	£	s.	d.		£	s.	d.
To Balance	187	17	0	By Transfer to Royal Society General Account	397	0	0
„ Dividends	440	11	2	„ Balance	245	18	0
„ Income Tax recovered	14	9	10				
	£642	18	0		£642	18	0

Darwin Medal Fund.

£2,500 South Eastern Railway 4 per Cent. Debenture Stock.

	£	s.	d.		£	s.	d.
To Balance	212	11	3	By Balance	311	19	7
„ Dividends	96	5	0				
„ Income Tax recovered	3	3	4				
	£311	19	7		£311	19	7

Joule Memorial Fund.

£1,000 London, Brighton, and South Coast Railway Consolidated Guaranteed 5 per Cent. Stock.
£47 19*s.* 2*d.* 2½ per Cent. Annuities.

	£	s.	d.		£	s.	d.
To Balance	134	14	5	By Grant to H. T. Barnes	100	0	0
„ Dividends	49	6	2	„ Balance	85	12	10
„ Income Tax recovered	1	12	3				
	£185	12	10		£185	12	10

Brady Library Fund.

£280 2¾ per Cent. Consolidated Stock.

	£	s.	d.		£	s.	d.
To Balance	52	19	4	By Balance	60	11	9
„ Dividends	7	7	8				
Income Tax recovered	0	4	9				
	£60	11	9		£60	11	9

Gunning Fund.

£1,000 4 per Cent. Bond of His Excellency the late Dr. Gunning.

	£	s.	d.		£	s.	d.
To Balance	89	11	10	By Balance	109	11	10
„ Interest	20	0	0				
	£109	11	10		£109	11	10

Buchanan Medal Fund.

£258 9*s.* 2*d.* Metropolitan 3 per Cent. Stock.

	£	s.	d.		£	s.	d.
To Balance	18	15	8	By Payment to Sir J. Simon of Balance at date of last Award	2	19	5
„ Dividends	7	8	0	„ Balance	23	9	1
„ Income Tax recovered	0	4	10				
	£26	8	6		£26	8	6

Sylvester Medal Fund.

Dividends on the following Stocks held by Lord Rothschild and the Treasurer, for the Royal Society :—

£380 Egyptian 3½ per cent. Preference Stock.
100 London and North Western Railway Consolidated Stock.
120 London, Brighton and South Coast Railway Deferred Ordinary (A) Stock.

	£	s.	d.		£	s.	d.
To Balance	3	5	6	By Balance in hands of Messrs. Robarts, Lubbock & Co.	37	19	8
„ Dividend paid over by Messrs. Rothschild and Sons to Oct., 1899	27	5	2	„ Balance in hands of Messrs. N. M. Rothschild & Sons	26	16	1
„ Cash paid over by Lord Rothschild arising from change of investment	7	9	0				
„ Dividends received by Messrs. Rothschild during year	26	16	1				
	£64	15	9		£64	15	9

Hughes Medal Fund.

£2,099 13*s.* 8*d.* Bath Corporation 3 per Cent. Stock.
£2,022 14*s.* 1*d.* Local Loans 3 per Cent. Stock.

	£	s.	d.		£	s.	d.
To Bequest of Prof. D. E. Hughes	4,000	0	0	By Purchase of £2,099 13*s.* 8*d.* Bath Corporation Stock at 95	2,000	0	0
„ Dividends	44	6	7	„ Purchase of £2,022 14*s.* 1*d.* Local Loans Stock, at 98¾	2,000	0	0
				„ Balance	44	6	7
	£4,044	6	7		£4,044	6	7

Mackinnon Studentship Trust.

£3,741 13*s.* 9*d.* 2¾ per Cent. Consols.
£1,000 Metropolitan 2½ per Cent. Stock.

And the following Investments held by the Executors for Sale:—

10 Macdougall & Co., Ltd., £1 Shares fully paid.
50 Zeehan Montana Mines, Ltd., £1 Shares fully paid.
50 Netley House Co., Ltd., £1 Shares fully paid.
117 Normal Powder Ammunition Co., Ltd., £1 Shares (17*s.* 6*d.* paid).
6 African Gold Coast Co., Fcs. 500 Shares.

	£	*s.*	*d.*		£	*s.*	*d.*
To Net Balance of Cash paid over by Executors ...	249	5	4	By Law and Accountant's Charges	65	8	1
„ Dividends...	110	4	5	„ Balance	294	1	8
	£359	9	9		£359	9	9

£1,300 India 3½ per Cent. Stock.—General Account.
£5,006 10*s.* 3*d.* 2¾ per Cent. Consols.—Building Fund Account.
£395 5*s.* 1*d.* 2¾ per Cent. Consols.—Pension Fund Account.

To General Account:—	£	*s.*	*d.*	£	*s.*	*d.*
Treasury Grant in aid of Salaries, &c.:—						
One year to September, 1900	4,000	0	0			
6 months to March, 1901 ...	2,000	0	0			
The Liquidator, Kew Observatory Committee, Surplus on Kew Observatory Accounts	1,151	6	10			
Laboratory Revenue, January 1st to October 31st, 1900	2,350	0	0			
Gassiot Trust Fund, one year ...	454	4	1			
Dividends (3) on £1,300 India Stock, transferred from Kew Observatory Committee ...	32	12	3			
Donation from Sir Andrew Noble	100	0	0			
				10,088	3	2
„ Building Fund Account:—						
Treasury Grant in aid of Building and Equipment—on Account...	5,000	0	0			
Dividends (2) on £5,006 10*s.* 3*d.* Consols	64	11	0			
				5,064	11	0
„ Pension Fund Account:—						
Amount transferred from General Account	400	0	0			
Dividends (2) on £395 5*s.* 1*d.* Consols	5	3	4			
				405	3	4
				£15,557	17	6

By General Account:—	£	*s.*	*d.*	£	*s.*	*d.*
Laboratory Salaries and Expenses, January 1st to October 31st, 1900	5,400	0	0			
Transfer to Pension Fund ...	400	0	0			
Power of Attorney Fee, India Stock		11	6			
Cheque Book		16	8			
				5,801	8	2
„ Building Fund Account:—						
Purchase of £4,941 5*s.* 5*d.*, 2¾ per cent. Consols	5,000	0	0			
Purchase of £65 4*s.* 10*d.*, 2¾ per cent. Consols	64	11	0			
				5,064	11	0
„ Pension Fund Account:—						
Purchase of £395 5*s.* 1*d.*, 2¾ per cent. Consols	...		...	400	0	0
„ Balances at Bankers:—						
General Fund	4,286	15	0			
Pension Fund	5	3	4			
				4,291	18	4
				£15,557	17	6

BALANCE SHEET.

TRUST FUNDS.

November 11, 1900.

LIABILITIES.	£	s.	d.
To Bakerian and Copley Medal Fund	92	7	9
„ Brady Library Fund	60	11	9
„ Buchanan Medal Fund	23	9	1
„ Croonian Lecture Fund	14	4	3
„ Darwin Medal Fund	311	19	7
„ Davy Medal Fund	52	18	4
„ Donation Fund...	586	14	5
„ Fee Reduction Fund	245	18	0
„ Gassiot Trust Fund	165	4	4
„ Gunning Fund	109	11	10
„ Hughes Medal Fund	44	6	7
„ Joule Memorial Fund	85	12	10
„ Keck Bequest	—	—	—
„ Mackinnon Studentship Fund	294	1	8
„ National Physical Laboratory	4,291	18	4
„ Rumford Fund	129	8	6
„ Scientific Relief Fund...	802	7	2
„ Sylvester Medal Fund	64	15	9
„ Wintringham Fund	32	13	5
	£7,408	3	7

ASSETS.	£	s.	d.
By Cash at Bank on Account of Trust Funds:—			
General Account (Messrs. Robarts, Lubbock & Co.)	2,287	2	0
Scientific Relief Account (Messrs. Robarts, Lubbock & Co.)	802	7	2
Sylvester Account (Messrs. N. M. Rothschild & Sons)	26	16	1
„ National Physical Laboratory:—			
Bank of England Western Branch:—			
General Account	4,286	15	0
Pension Fund Account	5	3	4
	£7,408	3	7

A. B. KEMPE,
Treasurer.

We, the Auditors of the Treasurer's Accounts on the part of the Council, have examined the above Accounts (except those of the National Physical Laboratory, which are to be separately audited), and have found them correct.

M. FOSTER.
G. JOHNSTONE STONEY.
HORACE T. BROWN.

We, the Auditors of the Treasurer's Accounts on the part of the Society, have examined the above Accounts (except those of the National Physical Laboratory, which are to be separately audited), and have found them correct.

J. D. EVERETT.
J. H. GLADSTONE.
ROBERT H. SCOTT.

The following table shows the progress and state of the Society with respect to the number of Fellows as at November 11, 1900:—

	Patron and Royal.	Foreign.	Compounders.	£4 yearly.	£3 yearly.	Total.
Nov. 30, 1899 ..	4	49	126	87	233	499
Since Elected ..			+ 1	+ 2	+ 14	+ 17
Since Deceased ..	— 1	— 2	— 5	— 5	— 4	— 17
Nov. 11, 1900 ..	3	47	122	84	243	499

Account of Grants from the Donation Fund in 1900.

	£	s.	d.
Dr. G. J. Stoney, for his investigations upon Leonids...	2	12	0
Professor D. J. Cunningham, in aid of the publication in the 'Journal of Anatomy' of a paper by Dr. Gaskell on the "Origin of Vertebrates"	25	0	0
International Catalogue Committee, in aid of the expenses of the Committee, and of the British Bureau	150	0	0
Coral Reef Committee, in aid of the expenses of preparation of the monograph on the Atoll of Funifuti	116	0	0
Colonel Godwin-Austen, in aid of the preparation and publication of his work on "The Land and Freshwater Mollusca of India"	50	0	0
Geologists' Association, in aid of the publication of a paper by Dr. A. W. Rowe on English Chalk	50	0	0
	£393	12	0

OBITUARY NOTICES OF FELLOWS DECEASED.

BENJAMIN WARD RICHARDSON was born at Somerby, in Leicestershire, on October 31, 1828. He died November 21, 1896. In his boyhood he was an ardent naturalist; and for life he remained a naturalist in his diverse interests, and his intense curiosity in all natural phenomena. Had he concentrated his powers upon one department of research, he would have left a greater name to posterity, but he would have been a less interesting, and in his generation, probably, a less useful man. Richardson's scientific bent led him to medicine, and he was peculiarly fortunate in the two practitioners with whom he was placed as a pupil, both of them being men of like tastes to his own. Early in his career he found a chief interest in the practice of anæsthesia, and he then invented a chloroform inhaler. On settling in London to practise, he pursued this study, and thus became engaged in a research into the alcohol and ether series; it was characteristic of him that in this research he never lost sight of practical applications: he introduced "bichloride of methylene" as an anæsthetic; he invented the "ether spray" for local anæsthesia; and the "lethal chamber," still in use, for the painless extinction of dogs and other animals. His energy and endurance were marvellous, no subject in or near the sphere of medicine did he leave untouched; in many of them he showed some originality of conception, and none did he fail to enliven with some fresh illustration. Thus his lectures were very popular and effective. A general reference may here be made to his work on pharmacology, especially on nitrite of amyl; on toxicology; on oxygen and artificial respiration.

In 1854 he obtained the Fothergillian Medal of the Medical Society of London for an essay on the "Diseases of the Fœtus in Utero"; and in 1856 the Astley Cooper Prize for his essay on "The Coagulation of the Blood."

Richardson's vigilant eye to immediate usefulness—to the applications of science—arose in part from his busy disposition, but largely also from his profound humanity. Having convinced himself by his investigation into the effects of alcohol upon animals that these were injurious, he promptly became a total abstainer, and as a missionary in this cause never relaxed his efforts to the end of his life. The same impulses and qualities of character led him to the van of the comparatively new science and art of sanitation. By his enthusiasm and accomplishments in this field, perhaps he will be chiefly remembered. In 1862 he founded the 'Journal of Public Health,' which, with some changes in title and continuity, he edited until his death.

In 1861 he founded the quarterly journal, 'The Asclepiad,' a marvellous medley of clinical medicine and of curious learning in medical history and biography, written entirely by himself. This journal also he kept up with great spirit and ability to the end of his life. Not content with these many functions, and amid the distractions of practice, Richardson found time to devote to poetry and letters and transcendental philosophy.

By his friends he will be remembered as a kindly, genial man, living a very full but also a very sociable life; for, teetotaller as he was, he was a spirited and entertaining table companion, and a good after-dinner speaker.

Richardson was made a Fellow of the Royal Society in 1867, and was knighted in 1893. His autobiography was published under the title of 'Vita Medica,' in 1897.

T. C. A.

EDWIN DUNKIN, the third son of William Dunkin, was born at Truro on 1821, August 19. His father had been for many years one of the established calculators of the 'Nautical Almanac,' performing the work at his residence at Truro until the organisation of the 'Nautical Almanac' office in London, under Lieutenant Stratford, R.N., caused him to be removed thereto. Mr. Dunkin received his general education at private schools at Truro and in London, being finally sent to a French school at Guines, near Calais, from which he returned on the death of his father in the summer of the year 1838. In August following he joined the staff of computers, organised by Sir George Airy, at the Royal Observatory, Greenwich, for reduction of the planetary and lunar observations made at Greenwich from the time of Bradley in 1750 to 1830, a position which he occupied until the year 1840, when, on the establishment of the Magnetical and Meteorological Department of the Observatory, he was transferred thereto, being one of the assistants (another being Mr. J. R. Hind, afterwards for many years superintendent of the 'Nautical Almanac') placed under Mr. James Glaisher as chief.

Although some attempt had been already made to apply photography to record the variations of meteorological instruments, there seemed at the moment little prospect of practical application of such method to the instruments of an observatory, and the work during Mr. Dunkin's time was consequently arduous, since eye observation of the magnetical and meteorological instruments had to be made at intervals of two hours day and night (except on Sunday, when a few observations only were made). On one day in each month observations of the magnets were taken at intervals of five minutes throughout the twenty-four hours in conjunction with similar observations made at observatories in other parts of the world, besides which during periods

of magnetic disturbance, so long as it lasted, observations had to be continuously made. One of the first remarkable magnetic storms observed was that of 1841, September 25, and the writer of this notice very well remembers the lively interest created when it became known that in such distant parts of the world as Toronto, Trevandrum, and the Cape of Good Hope magnetic disturbance of a like character had occurred on the same day, said as regards Toronto as appearing to have commenced "nearly at the same absolute time as at Greenwich."

In 1845, October, Mr. Dunkin was transferred to the Astronomical Department of the Observatory, and in the year 1847 was placed in charge of the then new altazimuth instrument, one specially designed by the Astronomer Royal for observation of the moon near to conjunction with the sun, before and after which epoch for a number of days more or less observation on the meridian is impossible; indeed, with this instrument, observations in other parts of the lunation were also frequently secured when the sky at meridian passage was cloudy.

In 1851 Mr. Dunkin was deputed to proceed to Christiania to observe the total solar eclipse of July 28. The weather on the occasion was not altogether favourable; he, however, saw three red prominences, one of which being watched and showing no apparent change of form gave him the impression of "some connection with the moon," with remark, however, that the circumstances being rather difficult, he was possibly deceived. It will be remembered that it was not until the total eclipse of 1860, July 18, that the red prominences were conclusively proved to be solar appendages. In 1854 Mr. Dunkin was superintendent of a party of six observers organised by the Astronomer Royal to make simultaneous pendulum observations at the surface and at the bottom of the shaft of the Harton Colliery (near South Shields), 1260 feet deep, for determining, from the observed variation of gravity, the mean density of the earth; and in 1855 he was charged with the setting up, in the Paris International Exhibition of that year, of a large-sized model of the new Greenwich transit-circle.

Before the establishment of the electric telegraph, the finding of differences of longitude, with the exactness which in a scientific point of view had become desirable, was a difficult problem. The method by transmission of chronometers had given the best results, but it was an operation troublesome and laborious and of necessity of restricted application. On the connection of the English telegraphic system with that of the Continent in 1851, by means of the Channel submarine cable, astronomers eagerly looked forward to employment of the telegraph for longitude purposes, and the Royal Observatory having been placed in communication therewith, it devolved on Mr. Dunkin, in conjunction with Sir Charles Todd (now Postmaster-General, South Australia), to inaugurate the method in 1853, May, by an experimental determination of the longitude of the Cambridge Observatory,

an operation that was entirely successful. It was at once seen that the telegraph, wherever available, had placed in the hands of astronomers a method that for convenience and accuracy surpassed all others—one that would become of great importance in geodetic work. It had been intended as regards the Continent to apply the method first to a determination of the longitude of Paris, but the illness and death of Arago having retarded this operation, attention was given to Brussels, the longitude of which was determined in the year 1853, being followed by that of Paris in 1854, in both of which operations Mr. Dunkin undertook a chief part, having for colleague in the latter work M. Faye. Other similar operations followed, one being the determination in 1862 of the longitude of Valentia, in Ireland, in order to complete the great arc of parallel from Valentia to the Volga, in which work, for finding the local time at Valentia, Mr. Dunkin employed an altazimuth, observing zenith distances of stars east and west of the meridian.

In 1845 Mr. Dunkin became a Fellow of the Royal Astronomical Society; in 1868 he was elected a Member of Council, and was one of the Secretaries from 1871 until 1877. In 1884 he was chosen President, occupying the chair until 1886, and delivering the presidential address in 1885, on award of the Gold Medal of the Society to Sir William Huggins, for his spectroscopic researches on the motions and constitution of stars and comets, and again in 1886, on the presentation of medals to Professor Edward C. Pickering and Professor Charles Pritchard, for their photometric work. Mr. Dunkin retired from the Council of the Society in 1891, having been an active member thereof for twenty-three years. At the time of removal of the Society from Somerset House to the new apartments at Burlington House, in 1874, the burden of work consequent thereon, aggravated as it was by the death of the Assistant Secretary, fell mainly on Mr. Dunkin. During his lengthy official career he contributed numerous papers to the Society, as a practical astronomer being interested in questions such as personal equation in observation, the probable errors of observation and in results, and the proper motions of stars, a paper "On the Movement of the Solar System in Space deduced from the Proper Motions of 1167 Stars" being his most important contribution; also whilst holding office as Secretary, the portion of the Annual Council Report dealing with the progress of astronomy during the year grew in interest and importance. Many notices of astronomers written by him for this Report, with some others, were published in 1879 in a separate volume, "Obituary Notices of Astronomers," which gives in a collected form an appreciative account of the labours of many noted men. Mr. Dunkin was elected a Fellow of the Royal Society in 1876, and served on the Council of that body from 1879 to 1881. From 1889 to 1891 he was President of the Royal Institution of Cornwall, in which capacity

he delivered in 1890 and 1891, in his native town of Truro, presidential addresses dealing with the progress of astronomy in modern times.

The labour of continuous observing work is in a public observatory somewhat arduous, and during the later period of his official life Mr. Dunkin was entirely relieved therefrom and placed in charge of the computing staff, although he still continued to be responsible for certain instrumental adjustments and determination of instrumental constants. In 1881, on the retirement of Sir George Airy from the post of Astronomer Royal, his successor, Mr. Christie, recommended Mr. Dunkin for the office of Chief Assistant, to which he was appointed by the Admiralty, and from which position he retired in 1884, after an official life of forty-six years.

Mr. Dunkin was one of various writers who in recent times helped to promote in the public mind that taste for astronomical pursuits now so evident. Some thirty years or more ago, in re-editing 'Lardner's Handbook of Astronomy,' he incorporated therein a large amount of new information on the progress of astronomy up to that period, of which more than one edition was published. And a following work, 'The Midnight Sky,' a popular exposition of the varying aspect of the starry heavens in each month of the year, has since enjoyed a wide circulation amongst that class of readers for which it was mainly designed; besides which he contributed articles of popular character on astronomical subjects to various of the periodicals of the time.

Mr. Dunkin married in 1848 Maria, the eldest daughter of the late S. J. Hadlow, formerly a member of the Stock Exchange. He enjoyed his retirement for fourteen years, retaining still his interest in the science in the promotion of which his life had been spent. He died at his residence on Blackheath, on 1898, November 26, in his 78th year, and was buried in the adjacent Charlton Cemetery, and his wife died in the year following. He leaves an only son, Edwin H. W. Dunkin, known for his archæological researches.

W. E.

WILLIAM COLENSO, born at Penzance, Cornwall, in 1811, was the eldest son of Samuel May Colenso, who married Mary Veale Thomas, both being natives of that town. On his father's side he was cousin to the late Bishop Colenso, of Natal, and on his mother's to Sir Penrose Goodchild Julyan, a colonial official. As a youth he was apprenticed to a printer of Penzance, from whence he went to London, where he was employed in the same capacity by the British and Foreign Bible Society. This led to his being sent by the Society to New Zealand, whither, in December, 1834, he carried the first printing press that was established in that group of islands. This occurred five years before they became a British Colony.

The mission station was at Pahia, in the Bay of Islands, where,

within six weeks of his arrival, though hampered by an incomplete outfit, he printed the Epistles to the Ephesians and Philippians in the Maori language. By the third following year he had printed the whole New Testament in Maori, and, with the assistance of natives only, had bound the copies with his own hands.

In 1844 he abandoned the work of printer, left Pahia for Hawke's Bay, took to missionary work, and after a training by Bishop Selwyn at St. John's College, Auckland, was ordained to a church in Napier, where he resided till his death in 1899.

From the date of his arrival in New Zealand Mr. Colenso took an active interest in the history, folk-lore, habits, languages, &c., of the natives, and being gifted with the love of natural history and of travel, a cultivated mind, an iron constitution, and methodical habits as an observer, collector, and recorder, all of which he used to the best advantage during a long life, it is not surprising that he was regarded as the Nestor of science in a colony his arrival in which antedated its foundation.

It was by a visit to the Bay of Islands in 1838 by Allan Cunningham,* the celebrated Australian botanist and explorer, then in charge of the Botanical Gardens of Sydney, that Mr. Colenso's attention was first drawn to botany; and to this visit, and those of Darwin in the "Beagle" in 1835, and of the Antarctic Expedition under Sir James Ross in 1841. he ever afterward referred as the most memorable events in his scientific career. From the latter date, after his philological and linguistic studies, that of the vegetation of the northern island was paramount. During the many journeys which he made, often through previously unvisited mountain regions, he observed and collected continuously, making discoveries that shed unexpected light on the affinities of the New Zealand Flora with those of Australia, South America, and the Antarctic Islands. Nor did his zeal diminish with age, for, as the result of an expedition made in his eighty-seventh year, he sent to Kew specimens and observations of plants made *en route*. His botanical writings, though numerous, are, as those on other branches of biology, fragmentary. They commence with one on Ferns, communicated to the 'Tasmanian Journal of Natural Science' in 1844; others occupy many volumes of the last-named work, of the 'Transactions of the New Zealand Institute,' and of the Hawke's Bay Philosophical Institute. Of these latter, the most important are: An account of visits to the Ruahine Mountains in 1845 and 1847, which is a repertory of information on the geography and vegetation of the previously unexplored regions visited; the first account of the dis-

* Allan Cunningham was naturalist in Capt. King's surveying voyage of the coasts of Australia, and discoverer of the Darling Downs, to which the sudden expansion of the sheep industry in New South Wales was due.

covery of the Dinornis bones; on the ancient (now extinct) dog of New Zealand; on the Maori races; on the vegetable food of the ancient New Zealanders; on the traditions of the Maoris, and on their sense of colour. Altogether, Mr. Colenso is credited with the authorship of thirty-two articles in the Royal Society's Catalogue of Scientific Papers down to the year 1883, and many have since appeared in the volumes of the New Zealand Institute.

For upwards of sixty years Mr. Colenso systematically took advantage of his unique opportunities for collecting information regarding the language, customs, myths, proverbs, songs, &c., of the Maoris, subjects that had a special fascination for him, and as the information obtained was direct from native sources—some of it from men who remembered Captain Cook's visits, and antedated the corruptions introduced by Europeans—the collection is of unique value.

In 1861 Mr. Colenso entered Parliament as representative of Napier, when he moved and carried a resolution that the time had come for the State to make an organised attempt to rescue the dying language of New Zealand from oblivion. Being at the time unable to undertake such a work himself, he offered to present the Government with his whole collection of materials for it. In 1865 the Government took up the subject, and in 1866 Mr. Colenso, then being more at liberty, was successfully urged, as the one man in New Zealand thoroughly qualified, to take up the work. Seven years was fixed for its completion, the remuneration to be £300 per annum. Before half that period had expired, another Ministry, with other views of the value of a Lexicon, had supervened, by whom its author was informed that, half the time allowed for the completion of the work having expired, one-half of the work itself should have been in the press. On the unreasonableness of this view in the case of a work requiring innumerable cross references being represented, a committee of qualified persons was appointed to examine and report on the progress made. The report was to the effect that the author had advanced further in his work than was due up to the time employed, that thousands of pages had been written from the first word to the last, and that seven years was too short a time for the completion of a work of such magnitude. The report was withheld from Parliament, funds for proceeding with the Lexicon were refused, and the unfinished materials were thrown upon the author's hands, one finger of which was permanently disabled by writer's cramp, due to his labours on the Lexicon. A sample portion was, however, demanded to be laid before the House, and letter A produced, but this was "lost," and not discovered till eighteen years afterwards in a departmental pigeon-hole. It was then printed and distributed by Government, partly at its author's expense, in the year preceding his death.* Its appearance, dedicated to his old friend Sir George Grey,

* A fuller account of the fate of the Lexicon will be found in 'Reminiscences of

has been followed by urgent representations to the Colonial Government that the whole materials, which are bequeathed to the State, should be entrusted to a competent editor for publication.

In 1890 he published an authentic history of the signing of the Treaty of Waitaugi, of which he was the sole surviving witness, a document regarded in the Colony as of great historic value. Towards the close of his life he offered his valuable library and all his collections to the town of Napier as the nucleus of a museum, together with £1000 as endowment, on condition that a suitable site and building were provided. The site proposed was, however, unsuitable, having an ocean frontage, the salt-laden atmosphere of which would have been detrimental to the collections; he therefore withdrew the offer, and transmitted the amount of the endowment to his native town of Penzance to form a fund, to which he subsequently largely added, for the relief of deserving poor.

In person, Mr. Colenso was, in 1841, as remembered by the writer of this notice, a man of medium height, brisk, active, and with a frank, winning address. Later in life he was conspicuous for his abundant long white hair on scalp and face. Only two years before his death, which occurred at Napier in February, 1899, he was thrown from a carriage, and, besides receiving a severe shock, had his right arm shattered at the elbow. Though then in his eighty-seventh year he recovered the use of the limb in so far as to wield his pen with his wonted energy, but with no little pain. He married in middle age, and left a family. He was elected a Fellow of the Linnean Society in 1865, and of the Royal in 1886.

J. D. H.

MARIUS SOPHUS LIE, the son of a Norwegian pastor, was born on the 17th of December, 1842, at Nordfjordeide.* Educated in a private gymnasium in Christiania, he entered the University of that city in 1859. He does not appear to have displayed any special predilection for mathematical pursuits in his student days; and even after passing, in 1865, his qualifying examination as a teacher, he remained in doubt as to the particular direction of his life. He gave private instruction in mathematics, and, after spending some time on astronomy, he turned to the consideration of the foundations

the Rev. W. Colenso,' by R. Coupland Harding, 'The Press,' Christ Church, New Zealand, February 27, 1899; and 'The Evening Post,' Wellington, February 13, 1899.

* The writer of this notice wishes to acknowledge his indebtedness to two articles on Lie by Professor Dr. F. Engel: one in the 'Jahersb. d. deutschen Mathematiker-Vereinigung,' vol. 8 (1900), pp. 30—46; the other in 'Bibliotheca Mathematica,' 3rd ser., vol. 1 (1900), pp. 166—204. Reference should also be made to an appreciation by Noether, 'Math. Ann.,' vol. 53 (1900), pp. 1—41.

of geometry—a subject to which he devoted more special attention in later years.

It was only in 1868, at an age much later than the average at which great mathematicians are wont to settle down to their life-work, that Lie found his true bent. In that year the works of Plücker on modern geometry first gave him the impulse towards research, and inspired him with original ideas, the gradual development of which gave him the first indication of his possession of mathematical powers. Thenceforward his life was one stretch of industry and activity; and the only interruptions to his creative work were the illnesses which overshadowed his later years, and were, without doubt, largely due to the exceeding strenuousness of his devotion to his investigations.

The publication* of his first paper, "Repräsentation der Imaginären der Plangeometrie," in 1869, led to a travelling scholarship which enabled him to visit foreign universities. The succeeding winter was spent at Berlin, where Lie and Klein met and contracted their long friendship, which was based, in the first instance, upon their common interest in the range of ideas associated with Plücker's geometry. Thence in the early summer of 1870 they went to Paris, coming into personal relations with Darboux and Jordan; and their growing interest in the theory of groups, first awakened in Lie by Sylow's lectures, which he had attended as a student, was stimulated for both of the two friends, as they recognised different modes in which that theory could be newly applied to branches of mathematics. In particular, Lie then discovered his now famous transformation, which makes a sphere correspond to a straight line, and by which, therefore, theorems on aggregates of lines can be translated into theorems on aggregates of spheres. The paper† containing this result was communicated to the Academy of Sciences by Chasles.

The visit to Paris was brought to an abrupt end by the outbreak of the war between France and Prussia. Klein was of course, as a German, bound to leave Paris; but the same obligation did not rest upon a Norwegian, and Lie remained until August, when he conceived a plan of walking through France to Italy. He had gone only as far as Fontainebleau, when a misadventure suspended his journey for a time. Let it be told in the words of Darboux‡:—

> "Occupé sans cesse des idées qui fermentaient dans sa tête, il allait chaque jour dans la forêt, s'arrêtant dans les sites les plus éloignés des sentiers battus, prenant des notes, dessinant des figures au

* Reprinted, under a different title, in 'Crelle's Journal,' vol. 70 (1869), pp. 346—353.

† 'Comptes Rendus,' vol. 71 (1870), pp. 579—583.

‡ See the 'Notice sur M. Sophus Lie,' spoken on the occasion when Lie's death was announced to the Academy of Sciences ('Comptes Rendus,' vol. 128 (Feb. 27, 1899), pp. 525—529).

> crayon. Il n'en fallait pas tant à cette époque pour éveiller les soupçons. Arrêté et incarceré à Fontainebleau, dans des conditions d'ailleurs fort douces, il se réclamait de M. Chasles, de M. Bertrand, d'autres encore; je fis le voyage de Fontainebleau et n'eus aucune peine à convaincre le procureur impérial; toutes les notes que l'on avait saisies et où figuraient des complexes, des systèmes orthogonaux, des noms de géomètres, ne se rapportaient en aucune façon à la défense nationale. . . . "

After a delay of four weeks, he continued his journey to Italy; then, travelling homewards through Switzerland and Germany, he returned to Christiania in December, after a joint note by Klein and himself had been communicated in that month to the Berlin Academy by Kummer.

From that date onwards, the history of the man is mainly the history of his ideas; the external incidents of his life are comparatively few.

At the beginning of 1871 he was assigned a junior post in his own University, and in the summer of that year he graduated as Doctor. The thesis then submitted was subsequently amplified and became his famous memoir,* "Ueber Complexe, insbesondere Linien- und Kugel-Complexe, mit Anwendung auf die Theorie partieller Differential-Gleichungen." In this memoir he constructs the theory of tangential transformations † for space; he applies it to partial differential equations of the first order; he develops the transformation of Plücker's line-geometry into a sphere-geometry, which now is regularly associated with his name; and he shows how the results can be applied to ordinary differential geometry, obtaining (among other properties) the result that his transformation of line-geometry into sphere-geometry makes the asymptotic curves of one surface correspond to the lines of curvature of the transformed surface. These are but a few of the results in a paper which is full of powerful methods and novel ideas; they are sufficient to show that the man who, before 1868, was hesitating about his vocation in life, had found an effective vocation by 1871.

In the succeeding year, the Norwegian Storthing was induced to create a special professorship for him in the University of Christiania.

* 'Math. Ann.,' vol. 5 (1872), pp. 145—256.

† The transformation of surfaces adopted makes (not merely a point correspond to a point, but) an element of any surface at a point correspond to an element of the transformed surface at the corresponding point. The property holds over the whole of the two surfaces, and, for instance, in the case of ordinary space, leads to the analytical relation

$$dz' - p'dx' - q'dy' = \rho\,(dz - pdx - qdy),$$

where x, y, z, p, q, define an element of the one surface, x', y', z', p', q', define the corresponding element of the transformed surface, and ρ is a non-vanishing quantity that does not involve differential elements. Such a relation is the basis of the analytical theory of tangential (or contact) transformations.

His appointment as Professor Extraordinarius in 1872 enabled him for the future to devote himself to his researches, free from the distracting necessity of supplementing the over-modest salary of his earlier post by private teaching.

About this time Lie seems to have made his first discovery as to the relations that can subsist between ordinary differential equations and infinitesimal transformations; the scope of such a relation can be indicated by the simple example of an equation of the first order. A function $\Omega(x, y)$ is said to admit a finite continuous group of transformations represented by

$$x_1 = \phi(x, y, a), \qquad y_1 = \psi(x, y, a),$$

where a is an arbitrary parameter, when

$$\Omega(x_1, y_1) = \Omega(x, y).$$

Such a group possesses an infinitesimal transformation, which may be represented by

$$x_1 - x = \xi(x, y)\delta t, \qquad y_1 - y = \eta(x, y)\delta t,$$

where δt is arbitrary, and the infinitesimal transformation determines the group. Moreover, the necessary and sufficient condition that the function $\Omega(x, y)$ should admit the above group is that the function should admit the infinitesimal transformation of the group, and the analytical expression of the condition is

$$\mathrm{U}(\Omega) = \xi(x, y)\frac{\partial \Omega}{\partial x} + \eta(x, y)\frac{\partial \Omega}{\partial y} = 0,$$

If the function Ω involves y', where y' denotes dy/dx, say, it is

$$\Omega(x, y, y'),$$

the analytical expression of the condition, that it admits the same group, is

$$\mathrm{U}'(\Omega) = \xi\frac{\partial \Omega}{\partial x} + \eta\frac{\partial \Omega}{\partial y} + \left(\frac{d\eta}{dx} - y'\frac{d\xi}{dx}\right)\frac{\partial \Omega}{\partial y'} = 0.$$

Now Lie discovered that, if an equation

$$f = \mathrm{X}(x, y)\,y' - \mathrm{Y}(x, y) = 0$$

admits the infinitesimal transformation just indicated, so that $\mathrm{U}'(f) = 0$, then

$$\frac{\mathrm{X}dy - \mathrm{Y}dx}{\mathrm{X}\eta - \mathrm{Y}\xi}$$

is an exact differential save only in the trivial case $\mathrm{X}\eta - \mathrm{Y}\xi = 0$; so that the transformation determines a factor of integrability, and thus, merely after a quadrature, leads to the integral of the equatio

Further, the significance of the result is not thereby exhausted, for it permits the construction of the differential equations of the first order that admit any given finite continuous group of transformations, for instance, a projective group. All that is necessary for this purpose is to construct the infinitesimal transformation which determines the group, and to obtain a couple of independent integrals, say u and v, of the system

$$\frac{dx}{\xi} = \frac{dy}{\eta} = \frac{dy'}{\frac{d\eta}{dx} - y'\frac{d\xi}{dx}};$$

the required equation is

$$u = \mathrm{F}(v),$$

where F is any functional form. Manifestly, such an idea is capable of wide application: under Lie's direction, it proved fruitful in succeeding years.

Similarly, the integration of partial differential equations of the first order was discovered by Lie to be bound up with infinitesimal tangential transformations under which they are invariantive. This discovery led him to resume the whole problem of the integration of such equations; and, as the outcome of his investigations, specially built upon the completed analytical theory of tangential transformations, he made two notable advances. One of these consisted in a great simplification of the known method of Jacobi, by effecting a material reduction in the number of quadrature processes; the other led him to a new method for the solution of Pfaff's problem, which, besides being simpler and shorter than preceding methods, indicated the real functional significance of the necessary analysis.

These results, obtained by connecting infinitesimal transformations with widely verging questions in differential equations, prepared the way for the consideration of a problem certain to possess an extensive range, viz., the theory of finite continuous groups of transformations, in general, and without special regard to any particular application. Lie began this work in 1873, and, for the next three years, concentrated upon it all the intensity of his creative enthusiasm: he once spoke of himself as having, during that period, lived only among his groups of transformations. The result was to constitute this theory an independent subject: begun, as already indicated, from its association with differential equations, and finding in its progress some of its most direct applications in that region; but, as the theory grew, it obtained a wider significance, and the geometrical bent of much of Lie's thought gave it applications within the region of geometry.

Towards the close of 1877 Lie had completed one stage of these investigations. His conclusions were embodied in a number of memoirs; many of them were published in a new journal in Christiania, edited by

Sars, Müller, and himself, some of them in the 'Mathematische Annalen,' most of the latter being revised and extended accounts of earlier papers. Apparently, Lie suffered from severe disappointment at the lack of interest so far shown in his work by mathematicians; his story at this time reads like the occasional experience of the investigator who lives, remote from fellow-workers and unstimulated by eager pupils, voyaging through his sea of thought alone, at the end finding himself weary, isolated, unacknowledged, perhaps therefore discouraged, and certainly left uncheered by any confident satisfaction that others are following him.

At any rate, whatever the explanation may be, Lie sought relief in change of subject, and devoted himself, almost entirely for the next few years and partially for the rest of his life, to differential geometry. In a long succession of valuable papers, he made masterly additions to our knowledge of minimal surfaces, particularly those which are algebraic; he dealt with surfaces which have their Gaussian measure of curvature equal to a constant, or are determined by other assigned relations between their principal radii of curvature; and he discussed surfaces as generated by the translational motion of a curve. The theory of his groups was frequently applied in these researches, and with considerable effect; thus his papers on the classification of surfaces according to the groups of transformations of their geodesics are of high importance. Darboux, in the 'Notice sur M. Sophus Lie,' already quoted, indicated his sense of the value of these contributions to differential geometry: no less significant is the testimony in Darboux's great treatise, 'Théorie générale des surfaces,' furnished by the number of references to Lie's name in its index.

Yet during this specially geometrical period, he did not altogether neglect the development of his theory of continuous groups; occasional papers were written from time to time, showing that it still occupied part of his constructive thought. Towards the end of the period, about 1882, his papers gave signs of his having again reverted to differential equations by applying his groups to the classification and integration of ordinary differential equations of any order. Moreover, the publication of Halphen's thesis on differential invariants led Lie to point out that his own earlier work included Halphen's investigations. His attention was thus again turned to the subject, and one consequence was that he gave the general theory of differential invariants, not merely for the projective group, as in Halphen's work, and in the subsequent detailed work of a number of English mathematicians, but for any finite continuous group of transformations.*

Lie's investigations had now extended over a considerable number of years. They had covered a wide range in a variety of subjects, and the results had been published in no consecutive form and in

* 'Math. Ann.,' vol. 24 (1884), pp. 537—578.

partly inaccessible places. He had from time to time thought of undertaking some treatises dealing with the main topics which had occupied his thoughts for more than fourteen years. But it was not until September, 1884, that any such project took a practical shape. In that month Friedrich Engel came to Christiania, partly in order to make himself acquainted with Lie's work, partly (on the advice of Klein and A. Mayer) to assist Lie, if that were possible, in making a systematic exposition of the whole theory of transformation-groups. It was exceedingly fortunate for Lie that he thus found some active co-operation and steady assistance in the execution of a severe, even exhausting, piece of work. The labour lasted for nine years. During that time, Engel's co-operation and assistance were given, without stint and in a loyalty beyond praise, and fully merited the acknowledgment which Lie made in his preface. The result was the 'Theorie der Transformationsgruppen,' a treatise in three volumes, covering over two thousand pages, the contribution to science by which his name will probably best be known. It is a work of great originality, containing many methods and a wide range of development; it exhibits in masterly manner the suggestive application of new methods to fundamental subjects; and it may be described briefly as a systematic exposition of Lie's investigations on groups of transformations that are continuous and finite. Among the subjects to which application is made, may be mentioned the theory of ordinary differential equations; the theory of partial differential equations, both single and in systems; differential invariants and their types; the solution of Pfaff's problem; tangential transformations, especially in spaces of two and three dimensions, and more generally in n dimensions; groups of functions transformable into one another, and a substantial simplification (by the use of their properties) in the integration of systems of partial differential equations; a complete determination of types of the groups of transformation in one, two, and three variables, and a partial determination of those in n variables. It concludes with a profound study of the foundations of geometry from the point of view of Riemann and Helmholtz; and after a critical discussion of the significance of the hypotheses which they made, he propounds a solution of his own, based upon more elementary hypotheses.

While this work was in progress, Lie changed the scene of his life by accepting, in 1886, the Chair of Mathematics at Leipzig, which had been vacated by Klein on his appointment at Göttingen; Engel accompanying him, and soon being nominated a colleague. Such a professorship possessed some obvious advantages for Lie as compared with the somewhat isolated chair at Christiania. It secured him a wider recognition; it gave him an audience; it offered him the chance of able pupils, who would work sympathetically in development of his mathematical theories. Though these advantages did not come early

enough to encourage him, still they did come gradually, and some of them in full measure. His work began to be known better and to be appreciated; his methods began to influence mathematicians. Pupils came to him from far and near, and one in particular, George Scheffers, rendered to him offices similar in kind to those rendered by Engel. When once the merit of his work began to be recognised, scientific honours were bestowed upon him freely. He received the honorary or foreign membership of societies and academies in great numbers; in particular, he was enrolled among our Foreign Members in the year 1895.

Unhappily, recognition appears to have been, not merely slow in coming, but almost too late when it came. There is no doubt that his ceaseless activity in thought and work had undermined his strength, and his spirit had brooded in its loneliness. He suffered from sleeplessness, and developed nervous symptoms: the result was a complete breakdown in 1889. The direct interruption of his work lasted for a large part of a year; happily he was afterwards able to resume it, and for a time was as fertile in production as he ever had been. But the effect upon the man never completely passed off; it seems to have exercised, upon his attitude towards life and in his personal relations with his friends, a morbid influence which lasted for the remainder of his days. The brighter side of these years is to be seen in the record of his continued work. How great that record is, may be gathered from the tale of his published work.* It includes over 150 memoirs, many of them of considerable length, and six volumes. Reference has already been made to his three-volume treatise on groups of transformations. In a couple of instances, his lectures in amplification and elucidation of portions of his theory were edited and published in volume form by his pupil, Scheffers, whose help is gratefully acknowledged: one of these relates to differential equations that admit of known infinitesimal transformations; the other to continuous groups.

Two other works were promised by him. One of these, to be written in co-operation with Engel, was to deal with the theory of infinite continuous groups and the application of the general group-theory to the integration of differential equations: this work has not appeared. The other, to be written in co-operation with Scheffers, was to be devoted to a systematic exposition of his geometrical investigations; the first volume has appeared under the title 'Geometrie der Berührungstransformationen.'

As his fame grew, placing him in the forefront of the mathematicians of his day, a strong desire was felt by his fellow-countrymen that he should return to Norway, and that some professorship of exceptional dignity should be created expressly for him in Christiania.

* A full bibliography is given by Engel in the article already quoted in 'Bibliotheca Mathematica,' 3rd ser., vol. 1; see pp. 174—204.

Such a post was made for him about 1896; but he only returned to his native country to occupy it in September, 1898. The desire of his fellow-countrymen was thus gratified honourably for Lie, but unhappily too late to be effective. His broken health forbade any long tenure of a chair in which, as had been hoped, he would be able to continue his mathematical researches. He was almost a dying man on the day of his return; he lingered through part of the winter; such little strength as was left was undermined by pernicious anæmia; and he passed away on the 18th of February, 1899.

Whatever be any prophetic estimate now made as to the position which the future will assign to Lie among the great mathematicians, his contemporaries and immediate survivors would agree in regarding him as one of the most conspicuous, independent, and original workers in his generation.

A. R. F.

July 10, 1900.

WILLIAM ROBERTS was born at Bodedern, Anglesea, on March 18, 1830. He was the youngest son of Mr. David Roberts, of Mynydd-y-gof, and of Sarah, daughter of Mr. John Foulkes, of Machynlleth, Montgomeryshire. Mr. David Roberts farmed his own land in Anglesea, and in addition practised as a surgeon in the neighbourhood, where indeed he was the only medical man. Both of Sir William Roberts's parents lived to a great age, and some of his elder brothers settled in Manchester, where they achieved distinction, and one of them, Alderman J. Foulkes Roberts, was Lord Mayor of Manchester in 1897. William Roberts received his early education in Manchester, subsequently he went to Mill Hill School, and he entered University College, London, as a medical student in 1849. Walsh, Garrod, Jenner, Quain, were amongst his teachers at this period, and Roberts came early under the influence of Sharpey, and the interest which he maintained throughout his life in physiological problems was probably aroused by the special influence of this teacher. Roberts had a distinguished career as a student at University College, and he graduated as a B.A. in the University of London in 1851, and took the degree of M.D. in 1854. After completing his studies in London, he studied for some months at Paris and also at Bonn and Berlin. In 1854 he was appointed house surgeon to the Manchester Royal Infirmary, and soon afterwards, when 25 years of age, he was elected, in July, 1855, without opposition, physician to the Royal Infirmary and lecturer on anatomy and physiology in the school of medicine. Subsequently he became lecturer on pathology, and, in 1863, lecturer on the principles and practice of medicine at Owens College. When the Victoria University was established he became Professor of Medicine. In 1883 Dr. W. Roberts resigned his physiciancy at the Royal Infirmary, after

serving on the active staff for nearly thirty years. During the whole of this time he was an energetic teacher of clinical medicine, and the thoroughness and lucidity of his teaching played a considerable part in the successful development of this great provincial school of medicine.

He was admitted a Member of the Royal College of Physicians in 1860, becoming a Fellow in 1865. In 1866 he was Gulstonian Lecturer, and chose as the subject of his lectures "The use of Solvents in the Treatment of Urinary Calculi and Gout," a subject which interested him throughout his life, and to which he returned in the Croonian Lectures delivered before the College of Physicians in 1892. He was Lumleian Lecturer in 1880, and served on the Council in 1882, 1883, and 1884. He was Censor in 1889 and 1890, Croonian Lecturer in 1892, and Harveian Orator in 1897. In 1877 William Roberts was elected a Fellow of the Royal Society, and he served on the Council of the Society in 1890 and 1891. In 1885 he received the honour of knighthood, and a few years afterwards, in 1889, he removed from Manchester to London, chiefly to obtain more leisure from the calls of a large consulting practice. In 1892 he was appointed a Fellow of the University of London, and subsequently, in 1897, he became the Chairman of the Brown Committee, and he also represented the University of London on the General Medical Council from 1896 till his death. He took great interest in the question of the provision of adequate university teaching in London, and in 1898 he was appointed a member of the Statutory Commission dealing with this question. In 1893 he was appointed the medical member of the Opium Commission, and the Report on the medical aspect of the use of opium was drawn up by him. His cautious mind and freedom from bias rendered him peculiarly suitable for forming a sound and correct opinion on such a hotly contested question. During his stay in India he collected information on the use of anarcotine, one of the alkaloids of opium, and he subsequently drew attention to the uses of this body as an anti-periodic. He held the view that one of the main beneficial uses of opium in such a country as India was dependent upon its being a prophylactic (thanks to the anarcotine it contained) against some of the malarial fevers of the country.

Throughout his life Sir William Roberts was actively engaged in investigating many problems connected with the scientific side of his profession. Both in Manchester and in London he had a laboratory in his house, and notwithstanding the calls of practice he found time to pursue in this laboratory the various investigations the results of which were communicated to this and to other societies. As a young man, in 1858, before he had embarked on the special line of investigation with which most of his subsequent work dealt, he wrote a remarkable essay on Wasting Palsy. This work was noteworthy in that it was not only

the first systematic account of the malady in our language, but also as showing the keen clinical instinct of the author, since the types recognised by him have been shown by modern research to belong to distinct and separate groups. Soon after writing this, however, Roberts began the series of chemical investigations on the urine with which his name is more especially associated, and a few years later, *i.e.*, in 1865, he issued the first edition of his well-known work on Urinary and Renal Diseases. This work was a great deal more than a text-book dealing with a certain class of disease; it contained much original matter, the results of the observations carried on in his laboratory, and more especially such questions as the daily variations in the reaction of the urine, the influence of food on the reaction, the estimation of sugar in diabetic urine by the loss of density after fermentation, were largely treated in the light of his own work. The last question was one that interested him throughout his life, and even during the last few weeks of his life, when prostrated by grave disease, he was still engaged in perfecting yet another method of determining quantitatively the amount of sugar by fermentation. In addition to devising new tests for the detection and estimation of sugar and proteids in the urine, Roberts's principal work about this time was the recognition and full description of the symptoms that ensue as a result of calculous suppression, and this chapter in subsequent editions of his book was one of the most important contributions to our knowledge of the effects of suppression of urine.

During the next few years, although still pursuing similar work, Roberts attacked the then vexed question of spontaneous generation, and carried out a long series of experiments, the main results of which were embodied in a paper in the 'Philosophical Transactions' for 1874, and his results are in accordance with the views of the present day. He had previously, in 1863, communicated a paper to the 'Proceedings' on the "Histology of Blood Corpuscles," and in it devised and described methods which were used for thirty years in the routine instruction of students. In 1879 Roberts began a series of investigations on digestive ferments and the artificial digestion of various foods. Many of his results were communicated to this Society in the 'Proceedings' for 1879 and 1881. Sir William Roberts's work on digestion not only added to our knowledge of the action of the digestive ferments, but the practical outcome of this work was very great in affording valuable means for feeding the sick in many diseases, and the very large number of digested and partially digested foods at present available is chiefly due to his work on the subject.

Subsequently to his removal to London in 1889, he carried out a long series of observations on the relationship of uric acid to gravel and to gout. He added considerably to our knowledge of the pathology of these diseases by showing the different decompositions that

the quadriurates underwent under different circumstances, liberating now uric acid, now a biurate, &c.

Sir William Roberts's record of work shows well what a busy physician can do in the way of accurate work in the scanty leisure afforded him in the intervals of practice, and all his work, whether chemical or histological, was characterised by the same scrupulous accuracy and neatness. It is probable that few, if any, of his statements of fact will require emendation, although doubtless some of the views founded on them may alter, and indeed have altered, with the lapse of years.

Sir William Roberts married in 1869 Elizabeth, daughter of Mr. Richard Johnson. This lady died in 1874, leaving as issue one son, who died in 1893. Sir William Roberts suffered severely from influenza in 1897, and in the autumn of 1898 symptoms of a more serious illness appeared, and the malady proved fatal on April 16, 1899. Sir William Roberts was buried at Llanymawddwy, Merionethshire, the village near his country residence, Bryn.

J. R. B.

William Henry Flower was the second son of the late Edward Fordham Flower, Esq., J.P., of The Hill, Stratford-on-Avon, being born on the 30th November, 1831. The fine erect figure of his father, also inherited by the son, was familiar in the Park when he was over the threescore and ten, and he was also widely known for his philanthropy, and for his indefatigable efforts to abolish the bearing rein of carriage horses; indeed his interest in the lower animals dated from his early experiences with his father in the American backwoods.

William Flower was educated chiefly at private schools, and from boyhood developed a taste for collecting and arranging objects of natural history. This led to his choosing the medical profession, the only one indeed that then and for many years later formed a sphere for such tendencies in those devoid of private fortunes. Entering University College, London, he had a distinguished career, gaining the gold medal in Anatomy and Physiology, and the silver medal in Zoology and Comparative Anatomy, the gold medal in the latter class having been won by Joseph Lister, lately the distinguished President of the Royal Society. He graduated as M.B. of the University of London in 1851, and became a member of the Royal College of Surgeons. He extended his experiences after graduation, by a tour through Holland and Germany in 1851, and through France and the north of Spain in 1853, bringing home, as usual, many sketches in pencil and sepia.

Life as a young practitioner in London did not long continue, for in 1854 he joined the Medical Department of the Army and

proceeded to the Crimea as Assistant-Surgeon in the 63rd Regiment, thus seeing service on land as his friend and predecessor in the Hunterian Chair (Professor Huxley) had seen service afloat. Many and varied were Sir William's experiences in this great campaign—both in field and hospital, for he was present at the battles of Alma, Inkerman, and Balaclava, as well as at the capture of Sebastopol, receiving the medal and four clasps, as well as the Turkish medal for his services. The fatigues, exposure and privations of this campaign severely tested the constitution of the young surgeon, yet in the intervals of duty, and with the scanty materials at his disposal, such as pen and ink and washes of ink and water, he made vivid sketches of his surroundings. Those who remember the terrible sufferings of the army in the Crimean winters, will not be surprised to find these sketches include his own tent blown over in the snow-storm of 14th November, 1854, and another of the prostrate tents of the camp towards the conclusion of the storm. The hospital at Scutari, a large panorama of Constantinople, and many other subjects proved his capacity to wield, with equal skill, both brush and scalpel. While he as a general rule, and with the eye of the anatomist, devoted great attention to form, yet from early days he was no stranger to sketches in water-colour.

His health, however, was seriously affected by his service in the Crimea, and he retired from the Army on his return to London. With the view of practising as a surgeon, he became Assistant-Surgeon, Demonstrator of Anatomy and Curator of the Museum in Middlesex Hospital, posts not uncongenial to the methodical and painstaking comparative anatomist, who utilised his opportunities in preparing his first work, viz.: "Diagrams of the Nerves of the Human Body," with six plates, the nerves having the names printed on them, and their distribution being clearly outlined. This work proved very useful to physiologists, students, and medical men. He also contributed an article on "Injuries of the Upper Extremities" to Holme's 'System of Surgery.' Two of his early zoological papers, viz.: "Notes on the Dissection of a Galago," and "On the Posterior Lobes of the Cerebrum of the Quadrumana," also pertain to this period.

There is no doubt that the breathing space thus afforded, allowed him time to collect his energies and gather up a store of valuable information for utilizing subsequently. Moreover, it was during this period of his career that he married in 1858, at the Church of Stone, near her home in Buckinghamshire, Georgiana Rosetta, youngest daughter of the late Admiral W. H. Smyth, K.S.I., D.C.L., F.R.S., who served the Society as Foreign Secretary, and was often on its Council. This step in Flower's history had an important bearing on his future success, for constant contact with such relatives as the distinguished officer just mentioned, with Sir Warrington Smyth, F.R.S.,

Professor Piazzi Smyth, General Sir Henry Smyth, Rev. Baden Powell, and others could not but tend to shape the career of the young comparative anatomist. A tour with his wife through Belgium and along the Rhine, made a pleasant holiday at this period.

The bent of his mind, as his friends Professor Huxley, Mr. George Busk and others perceived, was towards Comparative Anatomy, and he soon (1861) received a congenial appointment as Conservator of the Museum of the Royal College of Surgeons, a post rendered vacant by the death of Mr. Queckett, who had devoted much time and labour to microscopical researches in the Museum. Here in the midst of specimens, rendered historical by the labours of John Hunter and Richard Owen, and of new and important specimens added under his guardianship, he produced memoir after memoir, to which allusion will elsewhere be made. The collection itself under his fostering care attained a perfection and value that have made it famous all over the world, especially in regard to the skeletons and spirit-preparations of rare and unique forms. The patience with which he measured, figured, and described minute differences or salient features in skeletons, or exposed the characters of soft parts by dissection, have rarely been equalled. Moreover, as he generously acknowledged, the unique series of dissections of muscles, blood-vessels, and viscera (mostly human) was designed and largely executed by Professor Pettigrew, according to a process devised by this ingenious anatomist and physiologist. As the President of the Royal Society stated on presenting Sir William with the Royal Medal, "it is very largely due to his incessant and well-directed labours that the Museum of the Royal College of Surgeons at present contains the most complete, the best ordered, and the most accessible collection of materials for the study of vertebrate structures extant." These labours give to his work on Comparative Osteology an accuracy and thoroughness all its own.

Besides his more strictly scientific work, he about this time began the series of popular lectures by which he enlisted the sympathies of a wider audience, and extended general information on interesting and important subjects. One of his earlier lectures in this department brought under review the condition of the human foot and its coverings in the various races of men.

The retirement of his friend, Professor Huxley, from the Hunterian Professorship of Comparative Anatomy and Physiology in the College of Surgeons was followed by his own appointment, and he held this office from 1870 to 1884. His Introductory Lecture, in February 1870, brought in a memorable way before his hearers such topics as type or plan, transmutation of species and organic evolution, and he prefaced his remarks by explaining that as the main part of his knowledge was gained by constant contact with the noble collections in the Museum, so he intended to act as the mouth-piece of the specimens,

and endeavour to convey to his audience what they had taught him, and this and his subsequent courses more than justified his method. His comparison of the foot of the Koala and that of the Kangaroo, the teeth of the Thylacine and that of the Dog afforded his audience an excellent illustration of the developmental theory as propounded by Darwin and Wallace. His lectures were published in 1870. In the following course (1871) he gave eighteen lectures on the structure, functions and modifications of the teeth of mammals from man to the monotremes. The true teeth of Ornithorhynchus, however, were not then known, and it was reserved for Professor Poulton at a later period to demonstrate them. These courses of lectures often revealed the nature of his studies, *e.g.*, those of 1877 being "On the Relations of Extinct to Existing Mammalia," while those of 1880 were on the "Comparative Anatomy of Man, especially skulls from Viti Levu and Vanua Levu Islands, compared with the Tongans and Samoans." Few have any idea of the great amount of labour such courses involve, yet no one would have imagined this from the ever-ready and earnest efforts of the lecturer to give to others that knowledge, which it had been a pleasure to gain amidst the treasures of the Museum.

On his appointment to the Museum of the College of Surgeons, Sir William retired from practice, yet, though his subsequent career was devoted to science, he never lost touch with or interest in his old profession. This loyalty has been one of the most characteristic features of the scientific follower of medicine from early times, and is familiar to us in the lives of John Hunter, John Goodsir, Richard Owen, Thomas Huxley, B. W. Carpenter, George Busk, George Allman, John Hutton Balfour, George Johnston, Strethill Wright, and many others. Broader views are engrafted on medicine, and science is strengthened by the inclusion of such men in both, and it is well if this tradition is cherished in the present and in the future.

No comparative anatomist in recent times has more devotedly or with greater ability and accuracy studied the mammals; indeed the majority of his contributions to science, many of them of a very elaborate character, deal with this subject. Moreover, in every instance he has enlarged our knowledge, not only of the species, but, by acute and comprehensive views, he has extended that of the group; and since the range of his contributions in this department passes, with a few exceptions, from the Monotremes to the Primates, his influence in moulding the present literature of the subject has been immense. Amongst his earlier contributions, after entering on duty at the College of Surgeons Museum, are papers on the anatomy of the Primates—including both old and new world forms. His researches on the brain of the higher apes formed an important feature in the discussions which took place between Owen and Huxley in regard to the posterior

lobe of the brain, the posterior cornu, and the hippocampus minor being or not being diagnostic of separation between man and the monkeys.

Owen, at the Cambridge meeting of the British Association in 1862, maintained—from casts of the human brain in spirit, and from a cast of the interior of the gorilla's skull—that in man the posterior lobes of the brain overlapped the cerebellum, whereas in the gorilla they did not; that these characters were constant, and therefore that he placed man with his overlapping posterior lobes, the existence of a posterior cornu in the lateral ventricle, and the presence of a hippocampus minor in the posterior cornu—under the special division Archencephala. Moreover, he grouped with these features the distinctive character of the foot of man, and showed how it differed from that of the ape and gorilla.

Flower's accurate investigations in this field gave rise to a valuable contribution "On the Posterior Lobes of the Cerebrum in the Quadrumana," and enabled Huxley to substantiate his position that these structures, instead of being the attributes of man, are precisely the most marked cerebral characters common to man with the apes. Huxley also demonstrated that the differences between the foot of man and that of the higher apes were of the same order, and only slightly different in degree from those which separated one ape from another.

Early in the sixties Flower's papers on the neck-vertebræ of the sea-cows, and on a Lesser Fin-whale stranded on the coast of Norfolk, seem to have aroused within him a latent charm for cetacean structure —a charm which held him to his last working moment. Hence the prominence in his subsequent labours of memoirs dealing with the subject, *e.g.*, "The Skeletons of Whales in Holland and Belgium," "A Tasmanian Grampus," "*Pseudorca meridionalis*," "Sibbald's Rorqual," "The Pevensey Fin-whale," "Identity of Fin-whales Carolinæ and Sibbaldii," "Four Specimens of the Common Fin-whale," "Osteology of the Cachalot," "On the Fin-whale of Langston Harbour," "On a Sub-Fossil Whale in Cornwall," "Ziphoid Whales," "Skeleton of the Chinese White Dolphin," "On Risso's Dolphin," "On Recent Ziphoid Whales," &c. In 1866 he also advanced his favourite study by translating and editing for the Ray Society the classical memoirs of Professors Eschricht, Reinhardt, and Lilljeborg on the Whales, and adding many important notes and an illustrated appendix of his own. Other contributions on the cetaceans and their allies included "On the Skull of Xiphodon," "On Dr. Haast's Ziphius and Mesoplodon," "On a Collection of Seals and Cetaceans from Kerguelen," "On the Common Dolphins," "On the Cranium of Hyperoodon," "On a Whale of the Genus Hyperoodon," "On the Characters of the Delphinidæ," "On a Species of Rudolphi's Rorqual taken on the Essex Coast," "On the External Characters of Two Species of British Dolphins." No one in

our country, except Sir William Turner, has laboured more persistently and with such conspicuous success at this interesting and important group, and no one had a clearer grasp of its affinities. Foreign museums were in some cases more than once ransacked for information, such as those of Leiden, Utrecht, Brussels, Louvain, Paris, Heidelberg, Berlin, Dresden, Nuremberg, Strassburg, besides those of Norway and Italy.

While thus engaged in his laborious observations amongst the skeletons and other parts of whales in the museums of Britain and the Continent, he imparted much of the more generally interesting information which he had accumulated in two fascinating lectures, the one "On Whales and Whale Fisheries," at the Royal Colonial Institute, and the other, "Whales Past and Present and their Probable Origin," at the Royal Institution. In concluding the latter he points out that the difficulty of deriving the whales from the primitive and probably omnivorous Ungulates is not great, since the aquatic branch might easily have gradually become more and more piscivorous, the purely terrestrial members more conclusively graminivorous.

The foregoing great labours of his life consistently culminated in the magnificent series of whales it was one of his last duties to arrange and exhibit, with remarkable ingenuity, in the hall which he had secured for them in the British Museum (Natural History). While the skeleton can be studied from one side, the coloured outline of the body, in papier-mâché, is placed on the other, and numerous drawings in water-colour (many by one of his daughters) still further enable the visitor to grasp the form and structure of these gigantic denizens of the deep, or of remote rivers. Here ranged, side by side, are giant finners and small porpoises, narwals and killers, the toothed whales having their heads one way, the whalebone whales having theirs in the opposite direction. No more fitting memorial of the skilful hand of the leading European authority on the subject could be found than this marvellous and unique display of forms—rare it is true—but replete with the most interesting habits and, in many cases, remarkable intelligence.

For some years after entering on his work at the College Museum, the brains of mammals formed a favourite study, and, besides the paper already mentioned, there were others "On the Brain of the Siamang," "On the Brain of the Javan Loris," "The Brain of Echidna," "The Brain of the Howling Monkey," "Cerebral Commissures in Marsupials and Monotremes," the latter in reply to Sir R. Owen's paper on zoological names of characteristic parts and homological interpretations of their modifications and beginnings—especially in reference to the connecting fibres of the brain.

Amongst the papers which had an important influence in zoology was that in 1867, "On the Development and Succession of Teeth in the Mar-

supials." He showed that there was but a single tooth (hindmost premolar) on each side of each jaw with a vertical predecessor or undoubted milk-tooth. In the kangaroos, opossums, and thylacines this single tooth is homologous with that most persistent in typical diphyodonts, viz., the posterior milk molar—replaced by the posterior pre molar. It is interesting that he interpreted the teeth in front of the latter as corresponding to the permanent set, an opinion the recent discovery of rudimentary milk-teeth substantiates. In the same group he discovered that the extinct *Thylacoleo carnifex* of Owen was not a carnivore, but, probably, a herbivorous marsupial, most nearly allied to the rat-kangaroos, yet having special features of its own in the diminished number of true molars, the great size of the trenchant anterior premolar, and the rudimentary canines. These two papers would alone have made a reputation, and rewarded his patient and persevering labours in the osteological collections of the Museum.

About this time (1870) he published his well-known "Osteology of Mammalia," which has been so useful to every student of the subject, and has done more than any other treatise to give an intelligent grasp of human anatomy; the skull, spine, pelvis, and other regions are treated separately, the typical form being given first, and then the special peculiarities. He further added a new bone (the tympano-hyal) to the well-worn subject of human anatomy. The success of this accurate and well-arranged work was great. A second edition was issued in November, 1876, many new features being interpolated, such as those relating to the chevrotain and the muntjac. A third edition followed, in 1886, with 134 illustrations, and a table of the vertebræ of 350 mammals. Dr. Hans Gadow, of Cambridge, assisted him with this edition.

His busy brain and fertile pen produced other important memoirs, the results of some being incorporated in the work just mentioned. These included "The Development and Succession of Teeth in the Armadillos," "On the Anatomy of Proteles," together with memoirs "On the Connection of the Hyoid Arch with the Cranium," "On the Pelvic and Shoulder Girdles," "On the Anatomy of *Ælurus*," "On the Carpus of the Dog, and of the Sloths," "On the Ringed or Marbled Seal and the Spotted Paradoxure," "The Lobes of the Liver in Mammals," "Halitherium," "Extinct Lemurina," "*Hyænarctos*," "Skull of Rhinoceros," "On the Elephant Seal," and "On the Value of the Characters of the Base of the Cranium in Carnivora." The latter paper showed that in the three great groups of the carnivores a gradational series is formed by the tympanic bulla and the character of the septum; so that there were structural grounds even on this head alone for the old groups of cats, dogs, and bears. His contributions to the structure of the mammalia, indeed, range almost over the entire field from monotremes to man, and in reading the long list of important

memoirs one marvels at the unflagging zeal and industry of the man and the penetration and sound deduction of the philosopher. His paper on the arrangement of the orders and families of existing mammalia following his contribution to the 'Encyclopædia Britannica' was the prelude to his standard work, along with Mr. Lydekker, on the mammalia. Again, few popular works can surpass—in the clear and comprehensive grasp of the subject, in felicity of expression, accuracy of detail, and well-chosen illustrations—his treatise on the horse (1891), which he truly makes a study in Natural History.

Besides his memoirs on the mammalia, Sir William Flower extended his studies to the birds, especially during his earlier years. Thus his contributions embrace an account of the "Gizzard of the Nicobar Pigeon," the "Gular Pouch of the Great Bustard," the "Skeleton of the Australian Cassowary," and "On the Substance ejected from the Stomach of a Hornbill."

Though he did not illustrate with his own hand many of his papers, Sir William was an artist of considerable ability. His beautiful sketches in water-colour during the Crimean campaign were the prelude to a much more extensive series made jointly by Lady Flower and himself during his enforced holiday in Egypt in 1873–4. These represent the most varied scenes on their route, and exhibit the accurate touch of the artistic naturalist, especially in the portraiture of animal and tree, and in the skilful treatment of the landscape. That he could, if time had permitted, have ably illustrated his own memoirs is proved by a glance at his careful drawings of the brains of the apes in the 'Philosophical Transactions.'

In no department was Sir William's medical training of greater value than in his studies at home and abroad in anthropology. These he pursued with patient enthusiasm in the Museum and elsewhere for years, accurately measuring and comparing thousands of specimens. As a result, there appeared in June, 1880, his important 'Catalogue of Specimens illustrating the Osteology and Development of Vertebrate Animals —recent and extinct. Part I, Man.' In this laborious and accurate work, he dealt with the general osteology of man, then with his dentition and, thirdly, with the special osteology of man, that is, those variations which have become so constant as to give distinctive characters to the several races. His important remarks on the measurements of skulls, and his tables for calculating cranial indices, nasal, orbital, and alveolar indices, all bore the imprint of scrupulous exactitude. He used mustard seed and Mr. Busk's choremeter in estimating cubical capacities. Before the publication of this work he had given various lectures and addresses on the same subject, such as "The Aborigines of Tasmania," "The Native Races of the Pacific," at the Royal Institution; "The Races of Men" in November, 1878, at Glasgow. Subsequently he further dealt with the subject in his

addresses as President of the Anthropological Section of the British Association in 1881, 1884, and 1894; in his address "On the Classification of the Varieties of the Human Species," at the Anniversary Meeting of the Anthropological Institute in 1885, "On the Pygmy Races of Men," natives (and it may be early inhabitants) of the west of Lake Albert Nyanza, and only a little over 4 feet in height, experts with the bow and arrow and great elephant hunters, at the Royal Institution; and on "Fashion in Deformity" in the same place. His papers on the "Size of Teeth as a character of Race," "On the Osteology of the Andaman Islanders," "On the Malicolese," and "On the Natives of the Fiji," likewise contain important contributions to the subject. The same may be said of his comparatively recent paper (1895) "On the Aboriginal Inhabitants of Jamaica," his conclusions being that the skulls present decided characters pertaining to the American type. His labours in this field are of great value, and some of his papers treat of races that are disappearing or that have disappeared, the materials for the study of which he was fortunate in obtaining. Sir William was thoroughly interested in this field, and the vigour with which he delivered the opening address to the Anthropological Section of the British Association at Oxford (1894) must have struck all who heard it.

His tenure of office, viz., twenty-two years, as Conservator of the Museum of the Royal College of Surgeons, was a splendid record of original and laborious work, of great administrative capacity, and of unvarying courtesy to visitors. The Museum was most popular under his management. There, amidst the almost unrivalled collections, the tall, fair-haired and earnest worker was daily to be found, minutely studying, comparing and measuring, or giving directions for the extension, arrangement, and classification of the varied and valuable contents. From a scientific point of view no post could have been better adapted for the man or the man for the post. With many and varied lines of study lying conveniently around him, in the quietude of an office less conspicuous and exacting than that of the British Museum, in the full vigour of manhood, and in the midst of sympathetic seniors, friends, and assistants, it can well be imagined that Sir William's powers attained great development, and that, perhaps, he never felt so full of happiness and satisfaction with his original work. It could not well be otherwise. His conscientious devotion to duty, his remarkable skill in devising methods of mounting, his artistic eye, his tact with subordinates, and the esteem in which he was held by zoologists and comparative anatomists at home and abroad, give a clue to his subsequent career, and show the training of one of the most accomplished and courtly comparative anatomists our country has produced.

Of his long-continued and conspicuous labours in the College

Museum little further need be said than to make a brief extract from the minute of the Council on the 13th March, 1884 :—

"Moved by Sir James Paget, seconded by Mr. Erichsen, and resolved unanimously :—'That the Council hereby desire to express to Mr. William Henry Flower their deep regret at his resignation of the office of Conservator of the Museum of the College. That they thank him for the admirable care, judgment, and zeal with which for twenty-two years he has fulfilled the various and responsible duties of that office, that they are glad to acknowledge that the great increase of the Museum during those years has been very largely due to his exertions, and to the influence which he has exercised, not only on all who have worked with him, but amongst all who have been desirous to promote the progress of anatomical science. That they know that, whilst he has increased the value and utility of the Museum by enlarging it, by preserving it in perfect order, and by facilitating the study of its contents, he also maintained the scientific repute of the College by the numerous works which have gained for him a distinguished position amongst the naturalists and biologists of the present time.'"

Professor Flower shortly afterwards was elected a Trustee of the Hunterian Collection of the College.

While in the midst of his labours in the Museum of the Royal College of Surgeons, he was, in 1879, unanimously elected to the important and prominent, though honorary, office of President of the Zoological Society, a post which he held till his death. Under his presidency the Society had an unbroken career of scientific success, and largely through his influence and that of the indefatigable and able secretary of the Society, the Gardens constantly received rare and valuable specimens from every quarter of the globe. The financial depression in the affairs of the Society which ensued in the early eighties was skilfully combated by his patient sagacity, and great administrative powers, and long before his death the Society reached a stage of prosperity which had rarely been equalled in its history. Many of his important scientific contributions had been made to the Zoological Society before his election as President, and many others were communicated subsequently, so that with his annual addresses, his experienced remarks from the chair at the ordinary meetings, his addresses on special occasions, for instance, in the Jubilee year, he took a conspicuous share in the work of the Society. By nature and culture he made an ideal President of such a body. Many a young zoologist, embarrassed during his communications to the meetings, has been encouraged and aided by the kindly help of the President, whose tact and resource on these occasions were always reliable. Here he also entertained great social gatherings of the Fellows, and their friends, as, for instance, in the garden party in the Zoological Gardens in June, 1887, functions in which he was so ably

seconded by Lady Flower, and which rendered these and similar social efforts so successful. The experience gained in similar social gatherings (such as receptions) at the Museum of the Royal College of Surgeons thus proved of value in other spheres. A distinguished man of science who could at a single reception at the College Museum interest 800 guests could not be otherwise than a power in popularising the department. This indeed was a notable feature in Sir William's career, and one that gave his public life a special character. He was equally at home in taking Royal Personages through the galleries of the Museum as in receiving bands of working men for the same purpose, and this ease was largely due to the fact that both the one and the other had implicit confidence in him.

On the resignation of Sir Richard Owen, whose long-continued and conspicuous labours had rendered British Comparative Anatomy esteemed everywhere, there was but one man whose life and work, and whose fame, pointed him out as Owen's successor, viz., Sir William Flower, and, accordingly, in 1884, he was appointed Director of the great Museum of Natural History at South Kensington. Thus slowly but surely the goal was reached by him who as a boy treasured and arranged the few zoological specimens that fortune sent in his way, and who in manhood left a splendid record of his able administration and artistic methods at the Museum of the Royal College of Surgeons. His long experience and natural gifts thus gave to the National Museum one of the most accomplished, courtly, and wise, administrators of the age; a man not only distinguished as an original investigator, but one whose high tone and affability won the hearts of officials as well as those of the public.

The great building in which he was henceforth to labour was the product of the genius of his predecessor, to whom he ever paid a just tribute for his gigantic labours, yet early in its history the keen eye of Sir William, while admitting the beauty of form, proportion, colour and material, looked in vain for administrative offices, libraries, laboratories, lecture-rooms, and, above all, accommodation for the vast and ever increasing collections necessary for scientific research. Some of these defects have, it is true, been remedied, but the result falls far short of the ideal which this Prince of Museum Directors* evolved from his unique experiences. However this may have been, he set himself with characteristic ability and energy to labour in his new sphere, and with such effect that the fame of the great Museum and its Director became cosmopolitan. The entrance-hall and neighbouring galleries

* This was the compliment Professor Virchow, of Berlin, paid him, when one who was accompanying him round the Museum of the College of Surgeons, expressed surprise at the perfect arrangements of the collection: "Why should you be surprised," said Virchow, "when the Museum is under charge of the Prince of Museum Directors, Professor Flower?"

soon teemed with unique groups, which, even to the popular mind, afforded an insight into the variations of animals, and their adaptation to the colour of their surroundings. Thus in one case were shown the variations of the canary, in another the remarkable varieties of the pigeon in domestication—jacobins, pouters, fantails, tumblers, carriers, &c.—all developed from the accompanying rock-dove. In a third the apparently endless sexual variations of the ruff, no two being alike. Illustrations of albinism, such as white sparrows, crows and blackbirds, and of the white winter-dress of the mountain hare and the ptarmigan, and of melanism made even the most casual visitor ponder over the information placed before him in the carefully prepared labels. In like manner the brown hue of sand-frequenting mammals and grouse told, by aid of the labels, its own tale. In the "bays" of the hall the splendid Index-Collection enabled students to comprehend the leading features of the various groups of animals in a manner never before seen. The exquisite dissections and artistic method of exhibition of these specimens alone would have made Sir William's term of office noteworthy. His young assistants—amongst whom the late Mr. Wray was the pioneer, and Dr. Ridewood his successor—vied with each other in the excellence and beauty of these preparations—made under the experienced direction of their chief. To zoologists they are ever fascinating and instructive. The skilful methods adopted for illustrating the various modifications and succession of teeth, of the structure of limbs, of claws, beaks, and wings, from the most rudimentary organs of the penguin to the great expanse of the frigate-bird and albatross, and of the colour, size, and number of eggs, cannot be surpassed. It was this methodical and accurate system of working that led Mr. Wray to ascertain the curious fact that the fifth cubital quill is absent in certain groups of birds, hence the term aquintocubitalism. In the invertebrates, such as the crustaceans and mollusks, the same thorough methods were adopted, so that the Index-Collection was a marvel of information. The great halls of the mammals, birds, reptiles, fishes and other forms, such as the corals, under his fostering care, assumed remarkable order and neatness, and new and rare specimens were rapidly accumulated. There was a striking improvement in the classification and taxidermy of the mammals, in the mode of mounting on stands, and in the acquisition of the larger and rarer African and Indian forms. In the collection of birds, the polished sycamore stands gradually disappeared, and, instead, a dull surface of a good cigar-brown was substituted by staining the wood. This was the result of careful experiment under the experienced eye and refined taste of the Director himself, and a suggestion from the late President of the Royal Academy, Lord Leighton. Every effort was made to give the specimens natural postures and natural surroundings. Thus, for example,

the tree on which the woodpecker was at work was cut down, the foliage modelled in wax, and all the surroundings carefully kept. Hovering birds were suspended by fine wire or thread. Birds making nests in holes, such as the Manx shearwater, sand-martin, and kingfishers, either had the actual parts or a model of these beside them, just as the nests of the gannets and guillemots on the Bass Rock were shown with their natural environment. The birds, moreover, were re-classified. In the same way Lord Walsingham's splendid collection of British butterflies and moths with their caterpillars and food-plants illustrated the life-history and often mimicry of this interesting group. He was busy with the life-histories of other important groups just before his retirement, *e.g.*, the food-fishes, and he would have illustrated these in the same complete and instructive manner.

A general guide to the Museum under his auspices was published in 1887.

While thus maintaining the high scientific reputation of the Great National Museum, he continued to popularise the institution and science by taking parties of working men round the Museum on Sundays, and occasionally a distinguished visitor, like Dr. Nansen, would also join the group. Nor was he less attentive to Members of the Royal Family, or to distinguished statesmen, like Mr. Gladstone, who honoured the Museum with their presence. Foreign rulers, like the Queen of Holland, the Prince of Naples, the Emperor Frederick of Germany, and the King of Siam, were also interested in the collection, so that the popularity and welfare of the Museum were greatly extended by the Director's tact and urbanity. Formerly, he had taken a leading part in interesting the Prince of Wales, who was present at Sir Jas. Paget's Hunterian Oration in 1877, in the Museum of the College of Surgeons, and in arranging for an exhibition of the Prince's Indian Hunting Trophies at the Zoological Society shortly afterwards, so in his new sphere Royal and other powerful influences were utilized for the improvement and popularising of the collection. Military and Naval Expeditions, Exploring Expeditions, all contributed their quota to the National Museum. One of his last collections of this kind was Emin Pasha's from Central Africa.

The Trustees, when Sir William reached the age-limit of the Civil Service, extended his period of office by three years, but in July, 1898, failing health compelled him to resign. A Minute of the Standing Committee of the Trustees, signed by Lord Dillon, expressed their profound regret at his retirement, and paid him every compliment possible as the worthy successor of Sir Richard Owen, and as one who had organised a Museum of Natural History so pre-eminent amongst the Museums of the civilised world. Thus ended his thirty-six years of Museum work.

The energies of Sir William, while thus more than fully occupied,

were yet often taxed by the organisation or the ceremonies connected with the opening of museums in the provinces, and, unmindful of self, he often expended much time and strength in their interests. His addresses in connection with the "Booth Museum at Brighton," and "Local Museums" at Perth, are examples. Besides, in the able and eloquent address which he delivered as President of the British Association at Newcastle, he dealt in a comprehensive manner with "Museum Organisation." "Modern Museums," again, formed the theme of his address to the London Meeting of the Museums' Association, of which he was President.

"School Museums" were specially treated in an article in 'Nature,' and "Boys' Museums" in 'Chambers' Journal.' Lastly, "The Museum of the Royal College of Surgeons of England" formed the subject of a most interesting address to the Anatomical Section of the Medical Congress. He had besides the distinction of opening the great Marine Laboratory at Plymouth, and he performed this duty in a manner worthy of the occasion and himself. Moreover, at a time when his health rendered such a journey inadvisable, he generously travelled northwards at the end of October, 1896, to aid Lord Reay in opening the Gatty Marine Laboratory at St. Andrews.

Few scientific men of position have exerted themselves more continuously to popularise science than Sir William. Some of his earlier lectures were to Mutual Improvement Associations and non-scientific bodies, while the majority were to mixed audiences, or to more or less scientific ones. Some of his lectures at the Zoological Gardens, and in connection with the Zoological Society, contained the result of much patient research, such as those "On Sloths and Ant-eaters," and "Dolphins," and the same may be said of those "On Horses, Past and Present," "Cattle, Past and Present," and "Fins, Wings, and Hands," at the London Institution; "On Wings of Birds," "On the Horse," and "On Seals," at the Royal Institution. In all these his fluent delivery and fine presence, as well as his thorough acquaintance with the subject, carried both instruction and conviction to his audience.

His addresses, like his lectures, covered a wide area, and his energies must often have been severely taxed in the performance of so many engagements, while his busy brain was otherwise at work. His more general addresses included a loyal tribute to Her Majesty on Jubilee day at the Zoological Society in June, 1887, one when presenting the prizes to the students of University College, an address at the Church Congress, opening address to the First Chelsea Industrial Exhibition, 1887, a speech at the Civil Service Dinner of 1890, an address at the Burial Reform Association, others at the Shakespeare School on speech-day, the Church of England Society for the Promotion of Kindness to Animals, and to the Hammersmith School for Girls. That to the Church Congress, in 1883, was a notable one, since it treated of the

meaning of evolution and the kind of evidence on which it rests. "Can it be of real consequence," he asks, "at the present time, either to our faith or our practice, whether the first man had such an extremely low beginning as the dust of the earth, or whether he was formed through the intervention of various stages of animal life? The reign of order and law in the government of the world has been so far admitted, that all these questions have literally become questions of a little more or a little less order and law." He further pointed out that the evidences of the Divine Government of the world and of the Christian faith, have been sufficient for us, notwithstanding our knowledge that the individual and the race were created according to law. His eloquent and manly address must have had an important influence in placing the subject before the assembled clergy in a reasonable light. The range of his knowledge was equal to the calls made upon it, and he descanted with equal facility on burial in sand, in urging the claims of kindness to animals, or in strongly upholding his father's view as to the cruelty of the bearing-rein in horses.

His other addresses were stored with information or contained graceful tributes to the memories of deceased friends, like Darwin, Huxley, and Rolleston, as well as to other distinguished naturalists, such as Owen. In his address as President of the Department of Anthropology at York, in 1881, he alluded to the difficulties in the scientific investigation of man, the paucity of workers, of libraries, and museums. It must have been gratifying to him to find that within a few years great strides had been made, and that an Anthropological Institute, of which he was President, was devoted to the study of the subject he had done so much to advance by his researches and by his eloquence. At the meeting of the British Association in Aberdeen (1885), he was the foremost zoologist, equally at home in criticising the valuable papers by Sir William Turner and the late Sir John Struthers on the whales, beautiful skeletons of some of which had been prepared for the occasion; or in speaking on the interesting questions raised by Sir John Lubbock (now Lord Avebury) in his address on the dog, as well as taking a kindly interest in the remarks of the whaler, Captain Gray, whose model in wood of a right whale is now in the British Museum, and a woodcut from which illustrates his joint-work on the Mammals. He also gave an address at the Loan Collection of Scientific Apparatus at South Kensington.

A life so continuously devoted to the advancement of knowledge, and so productive in its results, was well worthy of the many honours that fell to him. Besides those already mentioned, he was made C.B. in 1887; he received a Royal Medal from the Royal Society in 1882 for his valuable contributions to the morphology and classification of the mammalia and to anthropology. He received the degree of LL.D. from the Universities of Edinburgh, St. Andrews, and Dublin (Trinity

College); D.Sc. from Cambridge, and D.C.L. from Durham (1889), and Oxford (1891), the public orator welcoming him as a proof of the proverbial saying attributed to one of the seven wise men of Greece, ἀρχὴ ἄνδρα δείξει, and as having passed with ever increasing distinction through a variety of public posts. The Government of the day (1892) made him K.C.B., and he was honoured with the Jubilee Medal from Her Majesty. He was a member of many foreign societies, institutes, and academies, such as the Netherlands, Sweden, Belgium, and France. Moreover, he was the recipient of the Royal Prussian order, "Pour la mérite" from the German Emperor, "the one European decoration," as a distinguished friend wrote in his congratulatory letter, "which an Englishman may be proud to wear, and bestowed, as I believe it to be, with the sanction of the very few who have already got it. It is the one order which real work, apart from rank and wealth and courtiers' tricks, alone can win." It was truly "the blue ribbon of literary and scientific decorations," as another distinguished friend wrote. Sir William was also appointed in 1881 a trustee of Sir John Soane's Museum.

One side of Sir William's life deserves special notice, viz., his social influence, and the endeavour to popularise the great institutions with which he was officially connected. These influences, developed at the Museum of the College of Surgeons with great success, were brought to bear on a much wider circle in connection with the National Museum and as President of the Zoological Society; and no one was more fitted than he—either for the courtly circle or the large gatherings of working men who flocked on Saturday afternoons to the galleries of the Museum. In all his many and varied social functions in his prominent positions he was ably seconded by one who identified herself with his every engagement, and to whom his last volume of collected addresses is dedicated. A man of wide sympathies: he is found at one time addressing a civil service dinner, at another a volunteer gathering, now descanting on evolution to a church congress, and, again, speaking at a mayoral banquet, a girls' school, or an industrial exhibition. The strain on his physique demanded by these efforts would have been great to an ordinary man, but it must have been serious to one whose main energies were heavily taxed by exhausting scientific work. His powerful constitution was thus slowly but surely sapped, yet to an eager mind and a generous heart, such as his, little heed was paid to himself.

The social side of Sir William's life and his sympathy with the affairs of men were further exemplified in his many communications to the 'Times' and other journals. Some of these were written in the cause of animals, such as that pleading for the bottle-nosed whales which were to be ruthlessly slaughtered as the devourers of food-fishes, or for the protection of birds, as in the appeal to ladies not to wear

white heron's or egret's feathers, since the birds were killed when nesting or attending their young. Others dealt with what may be called international zoology, as the Behring Sea question (and he also selected the British naturalist who visited the region). Amongst other zoological subjects were the preparation of anatomical specimens for museums, Emin Pasha's collection, kingfishers' nests, and dwarfs of Central Africa. He also advocated the placing of a statue of Huxley beside that of Owen and Darwin in the entrance hall of the British Museum, so that "Huxley and Owen, often divided in their lives, would come together after death in the most appropriate place and amidst the most appropriate surroundings." He descanted also on subjects so varied as the burial of the dead in slight frames and in sandy soil, on Cleopatra's Needle, on the gardens in Lincoln's Inn Fields, Postal Reform (in pointing out that while we can send a heavy book for a few pence, a heavy letter is costly, and thus he anticipated the arrangement of to-day), on Boehm's monument to Dean Stanley, and on the Cromer waterspout.

In private life no one was more beloved and esteemed. He was in every sense a domestic man, finding the highest joys that life brought him with his family and children. The same courtly bearing and high tone, the same reverence for all that was good, was in private circles mingled with the genial smile, the fascinating account of something interesting or novel, and the respect and deference to others which were part of his upright unselfish nature. Many a young naturalist will gratefully remember the kind encouragement and valued advice he was ever ready to offer, and the stimulus which the sympathetic interest of a leader in the department gave him.

In the busy life of Sir William and in the constant calls on brain and nervous system—strong though these were—there came times when a feeling of lassitude with headache, and spinal uneasiness, if not prostration, showed that the indoor life and the strain of many duties had told with severity both on the central nervous system and the heart. His annual holiday sufficed in many cases to recruit his energies, especially when he visited Scotland and the charming home of his friends, Mr. and Mrs. Drummond, of Megginch. There he met other friends, such as Dean and Lady Augusta Stanley and Colonel Drummond-Hay, of Seggieden, brother of Mr. Drummond. Moreover, he was always interested in the splendid collection of birds made by Colonel Drummond-Hay during his wanderings with the Black Watch, and which is placed in Megginch Castle, while a more recent and exquisite series of birds, like the former, mounted by himself, exists at Seggieden. But at other times a more prolonged absence from persistent work was necessitated. Thus it was that he made a tour with Lady Flower in Egypt during the winter of 1873–74; that he went to Biarritz in 1892.

Sir William had been in failing health for upwards of two years. The symptoms of overwork, causing an affection of the heart, became more pronounced after a journey to Scotland in the end of October, 1896, when he took a prominent part in the opening of the new Gatty Marine Laboratory, St. Andrews. A respite from duty in the beginning of the year 1897 became imperative, and this he took at Marazion, on the south coast of Cornwall. The needful rest, the fresh air, and the charming surroundings gradually restored him to a measure of health, and he returned to the work of the Museum. He spent part of the next winter abroad, but in 1898 he felt his health was no longer to be relied on, and he resigned his post at the British Museum. Last winter he resided at San Remo, returning home in May, 1899. Unfortunately a severe attack of pleurisy supervened after reaching London, and he gradually lost strength and peacefully passed away on July 1, in his 68th year.

Tall, fair-haired, and blue-eyed, he had a handsome form as well as a commanding presence, and these natural gifts were combined with a ready and earnest address, so that his appearance on public platforms, such as those of the British Association and the Royal Institution, was always welcome and always popular. In private life he was beloved by his family (which next to the Museum was his chief delight) and esteemed by his wide circle of friends, amongst whom the Stanleys and Huxleys were conspicuous. His was an ideal Christian character—guided by high principles and indifferent to mere superficial views and impressions, as his clergyman (Rev. Gerald Blunt) briefly wrote.

He was, besides, genial and considerate to all with whom he came in contact, so that no one could better have filled the important positions he successively occupied. Taken all in all, we shall not soon see so talented and so accurate a comparative anatomist, so impressive a speaker, so facile an artist, or a public man with a higher type of character. As was said by Professor Osborne of Professor Baird and Dr. Brown Goode, he "entered into the larger conception of the wide-reaching responsibilities of his position under the Government, fully realising that he was not at the head of a university or of a metropolitan museum, but of the museum of a great nation."

W. C. M.

CHARLES GRAVES was born in Dublin on November 6, 1812. He was the youngest son of Mr. John Crosbie Graves, of the Irish Bar, Chief Police Magistrate of Dublin, and Helena, daughter of the Rev. Charles Perceval. He received his early education at a private school near Bristol. He entered Trinity College, Dublin, in 1829, and obtained a scholarship—a distinction at that time given only for classical proficiency—in 1832; he graduated, in 1834, as the First

Senior Moderator and Gold Medallist in Mathematics and Mathematical Physics of his year. He was elected to a Fellowship in 1836, and took deacon's orders in the same year. He was appointed the Professor of Mathematics in the University of Dublin, in succession to the celebrated James McCullagh, in 1843. He married, in 1840, Selina, daughter of Dr. John Cheyne, Physician to H.M. Forces in Ireland. Graves was made Dean of Clonfort in 1864, and was promoted to the Bishopric of Limerick, Ardfert, and Aghadoe in 1866, during the viceroyalty of Lord Kimberly, being one of the last bishops appointed before the disestablishment of the Irish Church. His manners were characterised by dignified courtesy, and, in his hours of relaxation, by a genial and cordial ease and freedom. His wide culture, keen intelligence, and conversational powers made him a most attractive and agreeable companion. His calm judgment in practical affairs, combined with his fine tact and temper, have been justly and highly commended. By his liberal feeling towards those who differed from him and his kindness of disposition he won the esteem and regard of all, and especially of the people of the diocese over which for thirty-three years he presided, without distinction of sect or party—sentiments which were exhibited in a marked manner on the occasion of his funeral.

In 1841 he published a translation of the two elegant memoirs of Chasles 'On the General Properties of Cones of the Second Degree and of Spherical Conics.' In the copious notes which he appended to this translation, he gave a number of new theorems of much interest, at which he arrived by Chasles's mode of treatment. Amongst these may be mentioned his extension of the construction of an ellipse, as traced by a pencil which strains a thread passing over two fixed points, by substituting for those points a given ellipse, with which the locus described is confocal. This he deduced from the more general theorem on Spherical Conics; the latter being arrived at from its reciprocal theorem, viz., if two spherical conics have the same cyclic arcs, then any arc touching the inner curve will cut off from the outer a segment of constant area. It may be here observed that Bertrand, in his great treatise on the Integral Calculus, attributed the foregoing theorem of Graves to Chasles, who had subsequently arrived at it by an independent investigation. In a long appendix to the volume Graves gave a method of treating curves on a sphere corresponding to the Cartesian method on the plane, arcs of great circles taking the place of right lines. This theory he worked out in detail, supplying expressions analogous to the fundamental formulæ of plane analytic geometry, such as those for tangents, normals, osculating circles, evolutes, &c., and for the transformation of spherical co-ordinates. The whole was the fruit of Graves's independent research, though after the preparation of the Appendix he discovered that Professor Gudermann had partly anticipated his method, and that the properties of spherical curves had been

previously studied by Mr. Davies, who, however, used only polar co-ordinates, whilst those principally employed by Graves were rectangular. This memoir was greatly admired by Sylvester and other mathematicians, but their high expectations of its fertility have not been fulfilled.

This was the only mathematical book which Graves published. His other investigations were either embodied in the lectures which he delivered as Professor of Mathematics in the University, or in papers read before the Royal Irish Academy. Having been elected a member of that body in 1837, he filled successively the offices of Secretary of the Council and Secretary of the Academy, and was elected its President in 1861. About the same period, Sir William R. Hamilton, McCullagh, and Humphry Lloyd were also members, and the meetings were often made the occasion of announcing the results of the spirit of scientific investigation which then so remarkably prevailed in the University of Dublin.

While Hamilton was explaining to the Academy in a series of communications his new Calculus of Quaternions, several contemporary mathematicians were led to conceive systems more or less analogous to his, and, like it, involving new imaginaries. Graves proposed a system of Algebraic Triplets of this kind. But it must be said of it, as of the other similar systems, that it could not lay claim to anything like the power and flexibility of the Quaternions, and was not, indeed, so much a working method as an interesting mathematical curiosity. Other papers of his, published by the Academy, related to the theory of differential equations, to the solution of the equation of Laplace's functions, and to curves traced on surfaces, particularly on surfaces of the second degree. He gave a simple geometrical proof, published also in 'Crelle's Journal,' of Joachimsthal's theorem, viz., *that at all points of a line of curvature on an ellipsoid, the product* PD *is constant, where* P *is the central perpendicular on the tangent plane, and* D *is the diameter drawn parallel to the element of the line of curvature.* He also gave some very valuable applications of the Calculus of Operations to the Calculus of Variations, and especially arrived at a simple proof, by the Operational Method, of Jacobi's celebrated theorem for distinguishing between maxima and minima values in the application of the Calculus of Variations to single integrals.

On the death of Hamilton in 1865, Graves delivered from the Presidential Chair of the Academy an eloquent *éloge* of that eminent man, containing an interesting account of both his scientific labours and of his literary attainments.

Graves had much literary and artistic taste and cultivation, and to these were, no doubt, largely due the symmetry and beauty both of method and of results which are marked characteristics of his mathematical work.

As a member of the Academy, he devoted much time and thought to antiquarian subjects in connection with Ireland. It is a striking evidence of his versatility and varied accomplishments, that the eminent antiquary, George Petrie, having died shortly after Graves had paid the above recorded tribute to Hamilton's memory, he pronounced an *éloge* on him also, and was able to give as clear and competent a survey of the archæological researches of the one as he had done of the scientific investigations of the other.

A subject which he studied with special zeal was that of the Ogham inscriptions, so numerous in Ireland. He applied to the characters employed in them the accepted methods for the decipherment of writings, known or presumed to be alphabetical, and in this way confirmed the interpretation of these symbols which is given in some of the old Irish books. He then proceeded to give readings and to prepare renderings of a number of the actual inscriptions on cromlechs and other stone monuments. The subject is still surrounded with difficulties, and many archæologists have been led to entertain the view that the inscriptions, at least in some cases, are intentionally cryptic.

Graves brought before Government, in a special publication, the importance of having the old Irish laws, commonly called the Brehon Laws, edited and translated by competent scholars. The suggestion was adopted, and, when the project was taken in hand, he was appointed a member of the Commission charged with carrying it into effect, and held this office till his death, which took place on July 17th, 1899.

Graves was elected a Fellow of the Royal Society in 1880, and the Honorary Degree of D.C.L. was conferred on him by the University of Oxford in 1881.

B. W.

JOHN JAMES WALKER was born at Kennington, Surrey, on the 2nd October, 1825, and received his early education partly at the London High School and partly at the Plymouth New Grammar School. His father, John Walker, was successively Head-master of those schools during this period. The family on the father's side was originally derived from Yorkshire, but had been settled in Ireland for several generations. Matthias Walker the great-grandfather, John Walker, the grandfather, and John Walker, the father of the subject of this notice, were graduates of the University of Dublin. On his mother's side, Mr. J. J. Walker was mainly of English descent.

John Walker, the grandfather, was in orders of the Church of Ireland, and held a distinguished position as fellow of Trinity College, Dublin. He edited several classical text-books, formerly much in vogue among the students of the College, and also published works on elementary mathematics and logic.

As a natural consequence of the long connection of his family with the University of Dublin, Mr. J. J. Walker proceeded to Trinity College, and graduated at the Associated University of Dublin, B.A. in 1849, and M.A. in 1857. But he entered the College labouring under serious drawbacks, for it appears that owing to a notable evangelical movement which disturbed the official theology of the College and University, the representatives of Mr. Walker's family ceased to be conformists.

In the Book of Trinity College, published at the tercentenary (1591—1891), it is recorded of Kearny, the last Provost of the eighteenth century, "his only notable act was to refuse, with tears in his eyes, the resignation offered him, on the ground of religious difficulties, by the pious John Walker, and to expel him publicly on the next day."

Mr. J. J. Walker therefore was debarred from competition for scholarship or fellowship, and lay under other discouraging disabilities. The early death of his father hampered his resources, and made it desirable that he should, while still an undegraduate, take pupils when the opportunity offered. Nevertheless, he passed through the usual undergraduate course with great credit. After obtaining intermediate honours, he was Gold Medallist and Senior Moderator in Mathematics and Physics at the degree examination, and the year after (1850) obtained the second Bishop Law's prize, an honour highly esteemed in the College.

On the completion of his academical career, Mr. Walker engaged permanently in educational work. From 1853 to 1862 he was private tutor in the Guinness family. Soon after the close of this engagement he migrated to London, and in 1865 was appointed Afternoon Lecturer on Applied Mathematics and Natural Philosophy at University College School. In the same year he became a member of the London Mathematical Society, then recently formed. He was President of that Society 1888–90, and later on he became a member of the Physical Society. In 1883 he was elected Fellow of the Royal Society of London. His connection with University College School terminated in 1888, and his extended leisure was afterwards devoted to original research.

From 1868 to 1882 he was Vice-Principal of University Hall, and from 1871 to 1883 acted as examiner on Mathematics for the Hibbert Scholarships.

Mr. Walker was of a reserved temperament, marked by a somewhat precise courtesy of manner which seemed to belong to a bygone generation. His real kindliness was shown by genial estimates of character and liberal appreciation of the labours of others engaged in kindred studies. He died on the 15th February, 1900, at Hampstead, where he had resided for some years. In 1874 he married Emma

(youngest daughter of the late Mr. William Turner, of Newcastle), who survives him.

Numerous communications to leading scientific journals are due to Mr. Walker's diligence. They range from brief papers relating to particular problems of theoretical mechanics to elaborate memoirs on the higher algebra and geometry. Several papers show practical skill in the application of Hamilton's Quaternions to special and elementary problems, and he held the opinion that this method had been too much neglected as an instrument of research. Mr. Walker's most valuable work, however, was on the lines of the higher algebra as set forth in Dr. Salmon's famous text-books. Thus in the Proceedings of the London Mathematical Society we find three connected papers on a method in the Analysis of Plane Curves and Curved Lines. In these are developed the methods employed in the 9th Chapter of the Treatise on the Higher Plane Curves (2nd edition). In other papers particular attention is given to cubic curves. This study led up to the memoir, "On the Diameters of Cubic Curves," printed in the Transactions of the Royal Society, in 1889. In fact, Mr. Walker fully appreciated the modern operational methods, and his papers merit the attention of all who apply themselves hereafter to the advancement of the higher algebra and its application to geometry.

S. R.

ST. GEORGE JACKSON MIVART, of Welsh descent, was born at Brook Street, Grosvenor Square, on November 30, 1827, and educated at Clapham, at the school of the late Rev. Dr. C. Pritchard, and at Chiswick, afterwards at Harrow and King's College, London. It was intended that he should go to Oxford, but as he had meanwhile (1844) become a Catholic, his education was completed at St. Mary's College, Oscott. He was, in 1851, called to the Bar at Lincoln's Inn; but, drifting instinctively into Natural History pursuits, he, eleven years later, obtained the appointment of Lecturer on Zoology at St. Mary's Hospital Medical School, which he held until 1884. While there, he published his first paper and his first book—the former (1864) entitled "Notes on the Crania of the Lemuroidea," the latter (1871) on 'The Genesis of Species'; while, immediately following this, he produced a manual for students, which is still in circulation, under the title of 'Lessons in Elementary Anatomy' (1873). The publication, thus rapidly, of a paper involving a considerable amount of detailed observation and description, of one volume aimed at nothing short of a bold attack on the Darwinian doctrines, then slowly gaining ground, and of another of the nature of a compilation from a voluminous literature, showed Mivart to be an investigator and writer of no mean order, provided his works were sound. It is now a matter of history that his 'Genesis of Species' brought him into conflict with Huxley in 1872,

in the pages of the 'Contemporary Review,' with the result that while his book passed rapidly through a second edition, he and Huxley became estranged. Mivart's zoological work, so far as it has advanced knowledge, lay wholly with the Vertebrates, but he nevertheless essayed in the later 'seventies a series of articles in the 'Popular Science Review' on certain Invertebrates. Each of these bears as its title the name of a typical representative of a class ("Lobster," "Cuttle," "Echinus"), but is in reality an attempt at a very elementary survey of this, based on the fuller study of its most easily accessible genus. During the period of the production of these articles and again in later years, Mivart attended Huxley's lectures at the Royal School of Mines. In his article "Lobster" he admitted his indebtedness to Huxley's teaching, and in conversation with the writer he admitted it for his 'Lessons'—wherefore it would appear that these, his early works for the student, rank among the first products of the Huxleyean influence, at the time at which Huxley was arriving at the full conception of his famous "Type System," which permeates all his later educational books, and of which the germs are in reality to be found in his 'Physiography,' originally delivered as a course of lectures in 1869 and again in 1870, at some of which Mivart was present.

Mivart will be best remembered in history as he who most steadfastly opposed the subsidiary doctrines of Darwinism, and the theory of "Natural Selection" in particular. He tells us in his writings how he at first embraced the latter, as formulated by Huxley; but he very soon forsook it—and, remaining an Evolutionist, for the rest of his life defended with reiterated emphasis the argument that evolution proceeds from some internal force directed towards definite ends, and that it is due to processes which are sudden and distinct, and not to gradual changes. To him, the one central zoological fact which clenched this argument was the vestigial state of the index finger of the Potto, which, while later studying the Lemurs as a series, he came to regard as the culminating phase of a modification common to them all but one. He was never tired of reverting to this, both in his later writings and in conversation. The Potto's manus figures on the title-page of his 'Genesis of Species'—his first book, and he came to the fuller study of the Lemurs through his first paper, wherefore the main tenour of his life's work is seen to have been the direct outcome of his earliest impressions.

Much of his later work, both as a practical anatomist and a philosopher, further reveals the impress of these; for, while we find him in later years returning to the study of the Lemurs, we note that he extended his observations from their skeleton, to the brain, and, less conspicuously, the muscles and viscera, of both them and the higher Apes, in a series of memoirs which, as accurate records of observed facts, will always remain valuable. And there is reason

to associate his work upon the brain, the surface anatomy of which he carefully described in a large number of Mammals, with his famous argument, that psychical operations fall under two classes —"sense perceptions" alone performed by the brutes, and "intellectual perceptions" which, with them, being performed by man, involve him in a dual psychical nature. Right well did he defend this, more especially in his 'Origin of Reason' (1889), and his conviction, based upon it, that a passage from the "mind" of the brute to the conceptual mind of man is inconceivable.

It is in connection with these beliefs that Mivart will best be remembered as a philosophic writer; and, apart from those works already alluded to as directly concerned with their elaboration and support, he published others dealing with them and cognate subjects. His 'Nature and Thought—an Introduction to Natural Philosophy' (1882), and his latest philosophic work 'The Groundwork of Science' (1894), may be here named—the latter a most elaborate study of "Epistemology"—an attempt to define the basis of human knowledge, and to found a science of the sciences.

While in these writings Mivart has provided the thinking public with an immense amount of material for reflection and careful consideration, he has placed the world of working zoologists under a deep obligation for his numerous memoirs and papers, which are for the greater part painstaking records of structural detail, of immense service for reference. Some 73 in all—they are, with the exception of four, the work of his own hand; those in which he was assisted being memoirs on the anatomy of *Hyrax*, *Nycticebus*, and the Lemurs, written in conjunction with Dr. J. Murie, and a paper with the Rev. R. Clarke, "On the Sacral Plexus and Sacral Vertebræ of Lizards and other Vertebrata," which contains some facts of much interest in relation to the question of shifting during growth. Of the 73 works, 28 are devoted to the Mammalia, 6 each to Birds and Batrachia, 2 to Reptiles, and but 1 to Fishes. Beyond these, there are a number of magazine articles on other than controversial subjects, and reports of popular lectures, delivered at the Royal and London Institutions, the Zoological Gardens, and elsewhere, but they call for no special comment. He also wrote three articles in the ninth edition of the 'Encyclopædia Britannica,' viz., "Ape," "Reptilia" (Anatomy), and "Skeleton"; but while voluminous, these are neither remarkable for any striking originality nor wholly free of error.

Mivart's papers on the higher Amniota are predominant among his scientific writings, and their contents are but little concerned with anything beyond the examination of external characters, the dried skeleton, and the surface of the brain—*i.e.*, he was not an anatomist in the broad sense, given to elaborate dissection of parts difficult of access; for, with the exception of certain dissections of the muscular system of

animals he described, his "laboratory work" was done by deputy, as, for example, with his book on 'The Cat,' in which he was again aided by Murie. His best work is that upon the skeleton of Mammals and Birds, and chief among his papers are those dealing with the skeleton of the Primates and the Insectivora, which are laborious, and will always be of use for reference, and mark the introduction of terms which have been of great service. His papers on the Carnivora are also important, those dealing with the Æluroidea and Arctoidea being very welcome extensions of the late Sir W. Flower's, in which these names were originally introduced. "Man and the Apes" came under his consideration, and he has done good work in the detailed anatomy of their limb-bones; while not a few rarities have fallen to his lot, as, for example, the scarcer Madagascan Lemurs and Insectivores and the Batrachian *Plethodon*.

The aforementioned papers are collectively a valuable series, and conspicuous among the more generally interesting results which they embody are the orientation of the surfaces and processes of the monotreme shoulder-girdle, based on the study of its myology: the discovery of the "Ursine lozenge" in the brain of the Sea Lion, and consequent support of the Arctoid affinities of the Pinnipedia; the conclusion that the Batrachia-Aglossa are a natural group; and, finally, his growing conviction that the Lemurs are a sub-order distinct from man and the apes, and that they have been wrongly included in the Primates, for which he argued more and more emphatically in some of his later works.

More sensational was his paper in the Proceedings of the Royal Society 'On the possibly Dual Origin of the Mammalia,' in which, on the basis of the structure of the calcified teeth of *Ornithorhynchus*, he attempted to argue that the Mammalia may be diphyletic, and his remarkable memoir on the 'Fins of Elasmobranchs, and the Nature and Homologues of Vertebrate Limbs,' in which, contemporaneously with the American Thacher, he formulated the lateral fin-fold theory of the origin of these. This, on the whole, is his *chef-d'œuvre*, and except for error by failure to appreciate the fact that in the Batoid type, which he regarded as the most primitive, the forward extension of the pectoral fin is secondary and due to rotation, the theory is still in favour. In the manner in which the analogy between the behaviour of the corresponding parts of the median and lateral fins was utilised in defence of the theory, the memoir will always remain exemplary; and no slight public service was done at the time, by associated articles in the magazines and by popular lectures on the general subject of "Limbs," "Hands and Feet," in which all was treated in an up-to-date manner. This memoir presents Mivart at his very best, and if he had done nothing else he would through it have left his mark on the progress of science.

Much of his work lay with the Carnivora, as already remarked, and he in 1881 published a book of 530 pages upon 'The Cat,' with over 200 illustrations. Not only was this largely superfluous beside the existing memoirs of Straus-Durckheim and others, but it was disappointing; and it may be said of it that while it contains a good deal that is general and useful on the first principles and elements of mammalian morphology, it often fails just where aid is mostly needed with the animal with which it deals. Similarly, his papers on the Dogs led up to an elaborately-illustrated book, in which all the known species of "Dogs, Jackals, Wolves, and Foxes" are said to be described. Of this book, produced in haste, none but an adverse judgment can unfortunately be given; since, for want of depth of research, it is of little use to the systematist, and, in places, misleading to the public.

Huxley's 'Crayfish (an Introduction to the Study of Zoology)' appeared in 1880, Mivart's 'Cat (an Introduction to the Study of Back-boned Animals)' in 1881; and, similarly, while his book on the Canidæ followed a memoir by Huxley on the same subject, a close parallelism between other writings by the two men is recognisable.

Mivart was ever a controversialist in matters other than of philosophic doubt, and a keen upholder of priority. In proof there may be cited his share in defining the limitations of the term "Homology" in 1870, his justification of Owen's claims to have anticipated in 1848 the essence of the Weismannistic doctrines of the Immortality of the Protozoa and the Germ Plasma; and his defence of Buffon, when, in his Address as President of the Biological Section of the British Association, at its meeting of 1879, he sought to show that the claims of this bold generaliser (a man after his own heart) were overshadowed by those of Linnæus, on account of the two men having entered the world and achieved fame contemporaneously.

Continuing to contribute popular articles on Natural History subjects to the magazines throughout the 'eighties, during which he published (1876) his well-known work on 'Contemporary Evolution,' Mivart produced both books and essays until writing became almost a mania, pursued it would seem in some cases for mere effect. In 1892 he produced a work entitled 'Birds: The Elements of Ornithology,' in which he adopted the classification of Seebohm, which does not find favour among working ornithologists, and stated contradictions which a little more field natural history would easily have dispelled; and in 1893 he published a book on 'Types of Animal Life'—really an elementary treatise on the Vertebrata, in which the object of the method of arrangement is somewhat unintelligible and the head-lines are misleading. In 1894 he essayed the task of dealing under one cover with the elementary principles of all branches of science, including history and mathematics, and in this book, termed 'Elements of

Science,' which he dedicated to his father, he attempted an impossible task. Finally, in 1896, having during the preceding two to three years published a series of papers on the Osteology of the Parrots, which will be of great service to working zoologists, he produced a richly illustrated monograph on the 'Lories,' *en suite* with that of 1890 on the Canidæ, though much more thoroughly done and reliable.

With this memoir Mivart's career as a scientific worker ceased, but he continued writing; and as failing health overtook him he induced the reproach of the Catholic Church, by entering into controversy with Cardinal Vaughan, who, it is sufficient here to remark, anathematised where he was unable to refute, and brought about an excommunication.

Not content with this, Mivart, in the closing days of his life, revived a novel written years before, and, under the title 'In Castle and Manor,' completed it and secured its publication a week before his death.

He lived during middle life at 71, Seymour Street, W., and at Wilmshurst, near Fletching, in Sussex, and afterwards at Chilworth, in Surrey. Leaving there in 1894, he led a roaming life for a few years both at home and abroad, imagining himself a *malade*, until he finally settled in London, at 77, Inverness Terrace, Bayswater, where, after a series of heart attacks, which for the time being prostrated him, but which he threw off with magnificent vitality, he died suddenly on April 1, 1900, vigorous till the end.

Mivart was of imposing physique, dignified and stately in manner, and of a most charming temperament. As a host he was ideal: courteous, chivalrous, and considerate to a degree. A brilliant conversationalist, a fluent French scholar, he was quick to perceive and ready of repartee, and he had the power of making the most of every information which came in his way and of the aid of others in his scientific work. He loved history, hated poetry, and as a writer was always worth reading when at his best, as, for example, in his two volumes of collected reprints entitled (1892) 'Essays and Criticisms.'

Apart from the Lectureship already alluded to, he was in 1874 appointed to the Professorship of Biology in the newly-established but very short-lived Catholic College at Kensington; and during the years 1890—1893 he was Professor of "The Philosophy of Natural History" at the University of Louvain. This post he filled at the urgent request of the University authorities, who desired modern philosophic and scientific teaching for certain of their clerical students. Mivart's teaching, however, was too "tough" for clerical digestion, and as he was asked to accept the Professorship so was he asked to resign it. He delivered at Louvain two or three courses of lectures, which he gave in French.

From Louvain he received in 1884 the M.D., and from Rome in 1876 the Ph.D. He was elected a Fellow of the Royal Society in 1869, and was a Fellow of the Linnean, Zoological, and other scientific societies, on whose Councils he frequently served. He was several times a Vice-President of the Zoological and Linnean, and was for six years Zoological Secretary to the latter. He was also a Corresponding Member of the Philadelphia Academy of Sciences.

G. B. H.

EDWARD JOSEPH LOWE was born at Highfield, near Nottingham, in 1825, and was elected into the Royal Society in 1867. He was in his sixteenth year when he began that series of meteorological observations and records which terminated only when, in 1882, he quitted Highfield, and took up his residence at Shirenewton Hall, near Chepstow. He was one of the founders of the Royal Meteorological Society, and assisted the late Professor Baden Powell in his observations on meteors for the British Association.

In 1860 he accompanied the Government Eclipse Expedition to Spain, taking charge of the meteorological department.

Mr. Lowe's meteorological work commenced at a very early age, and in this department he apparently continued a series of observations at Highfield House, Nottingham, that had already been begun; for a printed table of "Meteorological Observations made at and near Highfield House Observatory" appeared in 'Recreative Science,' giving the mean temperature for each month from 1810 to 1859. His own observations appear to have commenced in 1840, and were continued till 1882. From June 10, 1872, till April 3, 1882, he reported observations by telegraph to the Meteorological Office, and from 1874 till 1882 he contributed returns of observations made at 0h. 45m. P.M. each day to a collection of synchronous observations made at nearly fifty stations in the British Isles, or in British possessions, for transmission to the United States.

But the contribution of numerical data was not by any means the limit of his activity. He collected, from very various sources, information concerning meteorological phenomena, and discussed it sometimes synoptically—as in the attempt to give a presentation of the state of the weather over England during certain conspicuous thunderstorms, which is contained in his Treatise on Atmospheric Phenomena (1846); or during the Eclipse of March 15, 1858*—sometimes chronologically, as in his pamphlet on the Chronology of the Seasons (1870), which gives an account of remarkable frosts, droughts, and other exceptional phenomena, which have been recorded as occurring in the British Isles since A.D. 220.

This latter work was to have been extended, and an introductory

* 'Roy. Soc. Proc.' vol. 9, p. 213.

portion assigning an eleven years' cyclical period to droughts was in fact published in 1880 under the title "The Coming Drought, or Cycle of the Seasons"; but the question was not effectively worked out.

He dealt with familiar "Prognostications of Weather" in a pamphlet with that title published in 1849, and in conjunction with Mr. J. B. Scoffern contributed a small work on Practical Meteorology to Orr's "Circle of the Sciences" in 1856.

Many striking observations of halos and allied phenomena made by himself and others are collected and illustrated in the "Treatise on Atmospheric Phenomena." Mr. Lowe managed to record a hundred and ten solar or lunar halos within four years at Nottingham. Later on he added to the collection a very remarkable case, which is figured in 'Nature.'*

He gave his attention, amongst other things, to the improvement of the means for testing the amount of ozone in the atmosphere, and he also contributed papers to the Astronomical Journals on Meteors, Sun-spots, and on the Zodiacal Light.

In addition to his researches in physical science, Lowe was an ardent naturalist, publishing works on conchology, on British ferns, grasses, and ornamental plants. He was an enthusiastic gardener, and his experiments on hybridisation were as remarkable as they were numerous. The hybridisation of flowering plants can be effected directly and without doubt. It is different in the case of ferns. Admixture of spores taken from different plants and close approximation of different individuals can alone be practised, and the results are correspondingly uncertain. Prothalli are formed bearing antheridia and archegonia, from which latter, after fertilisation by the spermatozoid, the new plant is formed! In Lowe's early experiments (1855) the seedlings were nearly all normal, whilst now (1890) "it is difficult for me to raise a normal form, one or two marked varieties used to be the reward, now they can be counted by hundreds." Ultimately Mr. Lowe obtained results of an astonishing nature. At the Fern Conference held in the Chiswick Gardens of the Royal Horticultural Society on July 23, 1890, Mr. Lowe showed not one but several plants, resulting from what he considered "multiple parentage"—that is, on the same plant, nay even on the same frond, were clear evidences of the influence of different varieties, the spores of which had purposely been mixed together. "The third experiment," writes Mr. Lowe in the 'Journal of the Royal Horticultural Society,'† "was the mixing together the spores of half a dozen varieties of the lady fern, and as a further trial, half a dozen varieties of the hart's tongue. This brought out a new fact—there were seedlings that showed the characters of three and even four varieties

* Vol. 15, p. 508.

† Vol. 12 (1890), p. 509.

on a single frond, so that male organs from several varieties had assisted in this impregnation. . . . . A further experiment with the hart's tongue is also of peculiar interest. An undulate form, a spiral form, a rugose form, and a tasselled form were sown together, and amongst the seedlings there are plants that exhibit all these characteristics."

Such statements naturally excited some scepticism on the part of those who did not see the evidences; but there could be no doubt of the facts, which were shown in abundance on the occasion mentioned, and subsequently we believe at the Bristol Meeting of the British Association and elsewhere. It may be that the researches into the number and division of the chromosomes may ultimately supply the explanation of these extraordinary phenomena.

Lowe pursued his hybridisation experiments with other plants than ferns. Some of the latest specimens with which he favoured the writer were the result of crossing dahlias with the pollen of sunflowers. Whilst there was evidence of a change having taken place, as if the balance of nutrition and growth had been disturbed, there was no clear evidence of any intermixture of parental elements.

The full record of Mr. Lowe's experiments is given, with many illustrations, in his work entitled "Fern Growing," published in 1895, a work which must be carefully consulted by all succeeding workers in the same field.

Mr. Lowe's observations and experiments were not confined to plants, but were carried out with cattle, pigs, sheep, and fowls.

Mr. Lowe was an honest enthusiast, firmly convinced of the correctness of his own judgment; but in spite of the very remarkable evidence he brought forward, he did not in all cases succeed in convincing his fellows, who entertained some doubt as to the care that had been bestowed to avoid error in the performance of his experiments, and consequently as to their value and the interpretation to be put upon them. It is for others to repeat his experiments under more precise conditions.

In private life Mr. Lowe was a warm friend, ever ready to be of service to his fellows, and fulfilling the duties of a country gentleman as a Deputy-Lieutenant and magistrate. He died on the 10th of March, 1900, at Shirenewton.

M. T. M.
W. N. S.

GEORGE JAMES SYMONS was born at Queen's Row, Pimlico, on August 6, 1838, and was educated at St. Peter's Collegiate School, Eaton Square, at Thornton in Leicestershire, and at the School of Mines.

In 1856, at the age of 18, he was elected a member of the British

Meteorological Society, now the Royal Meteorological Society. During these forty-four years he rendered invaluable services to the Society, as contributor to its 'Proceedings,' as member of council, vice-president, honorary secretary, and president; and in 1900 he was for the second time elected president in view of the jubilee of the Society, which was held in April. Indeed, it is very largely due to his able, well directed, and untiring exertions during these forty-four years that the Royal Meteorological Society holds its present position.

On the invitation of Admiral Fitzroy, he became a member of the staff of the Meteorological Department of the Board of Trade, in 1860; but this he resigned in 1863, in order to give his whole time to the collection of statistics of the rainfall of the British Islands. His first contribution to science was a paper on the thunderstorms of June, 1857, and it is interesting to note that it was during the investigation of this inquiry he received the bias towards rainfall inquiries, which rapidly became his absorbing life-work.

This life-work may justly be considered as having begun in earnest in 1860, by the publication of Rain Returns of that year, with the view of showing the then known distribution of rain over the British Islands. The large gaps this revealed in our knowledge of this important element of our British climate acted on Mr. Symons' mind simply as the strongest incitement to the establishing of numerous rain-gauges in all parts of these islands. In this work he at once evinced quite remarkable ability in establishing these stations, and in most effectively supervising them, and the statistics of rainfall supplied by them. By his well-directed energy, the results published in 1866 were justly regarded as fairly representative of the distribution of the rainfall of that year over the British Islands. In the last published Annual Rainfall, 1899, the number of Rainfall Stations is 3528, distributed thus—2894 in England and Wales, 446 in Scotland, and 188 in Ireland. During this long term of years, his relations with observers and societies, by letter or by personal visits, were most cordial, intimate, and continuous, the object aimed at, on all hands, being to make the record of the rainfall of each year as complete as possible. The result attained is that the Rainfall System set on foot by Mr. Symons, and carried out by him for forty years, is the most complete anywhere existing, looking to the extent of country covered by the rain-gauges, and to the trustworthiness of the records thereby collected of this prime element of climate.

The chief books which he wrote or edited are the forty volumes of 'British Rainfall,' and the thirty volumes of 'Symons' Monthly Meteorological Magazine.' Soon after the eruption of Krakatoa, it was suggested that the Royal Society should appoint a Committee to undertake an exhaustive report of the eruption. Mr. Symonds was appointed chairman of the Committee and edited the Report.

He was engaged for many years in compiling a catalogue of meteorological books and papers, which embraced a total of from 60,000 to 70,000 titles, and of these, in 1882, he contributed about 20,000 titles to a bibliography prepared by the Weather Bureau of the United States. His own private library numbered nearly 10,000 books and pamphlets, many of these being rare and in several cases unique copies of early meteorological works.

On February 14, he was struck down by paralysis. For a brief time he made some progress towards recovery; but unfavourable symptoms supervening, he died on March 10, 1900.

A. B.

INDEX.

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